THE IRON AGE

AGEMENT
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RODUCTION
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DESIGN
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PROCESSES
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NEWS
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MARKETS
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1931

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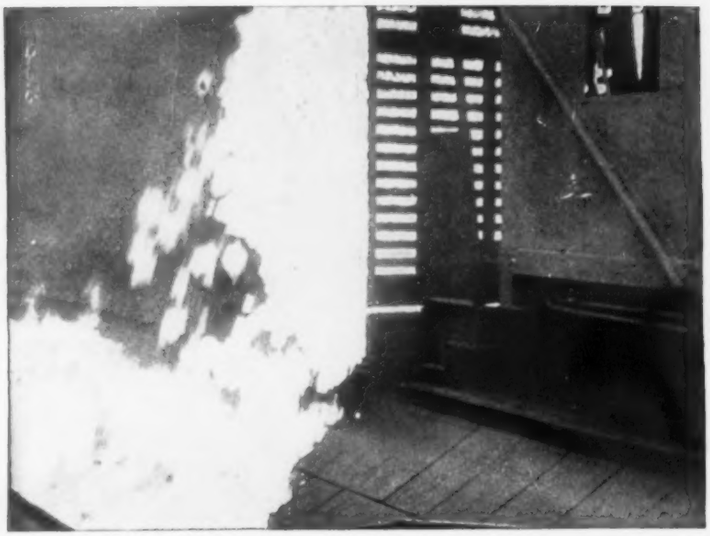
KOPPERS COKE OVENS

AG-ENG LIB.



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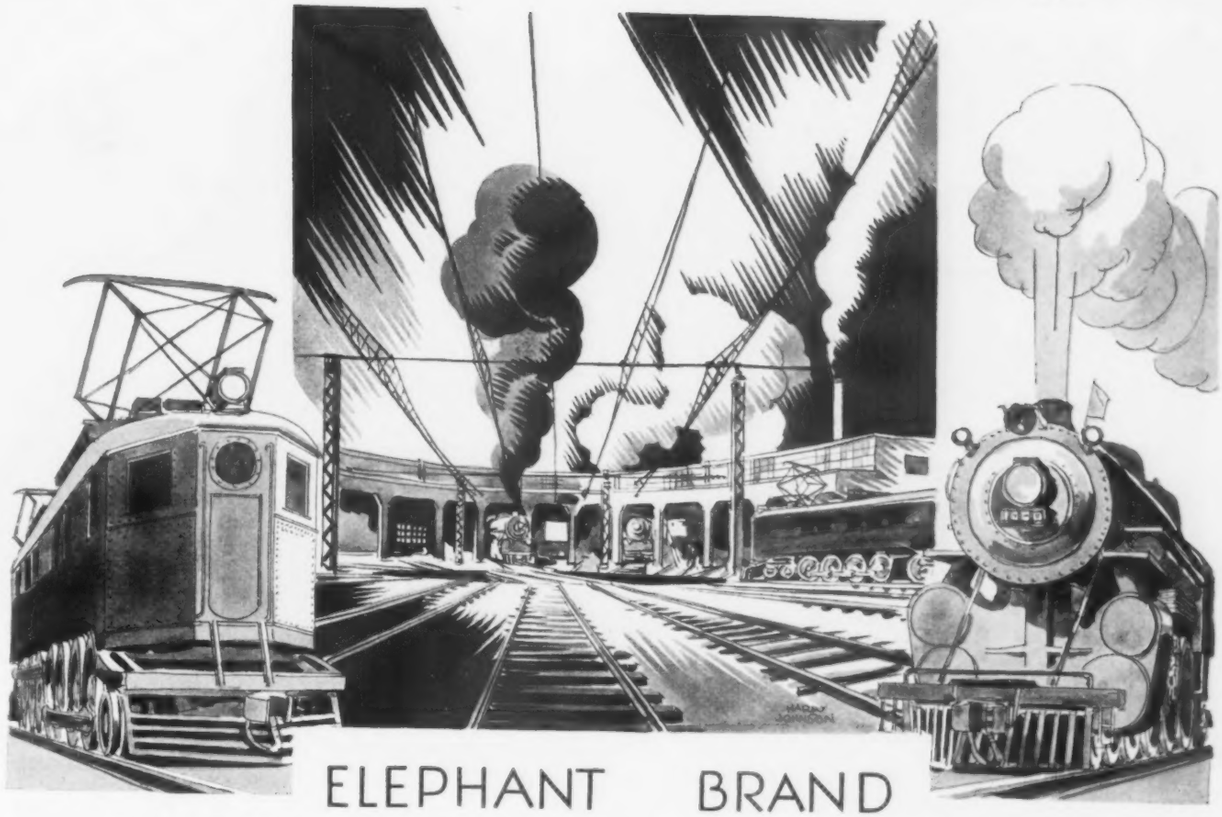

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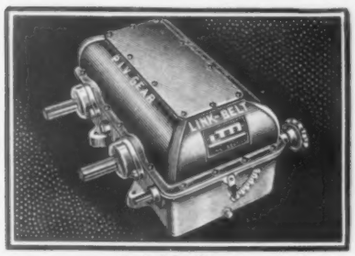
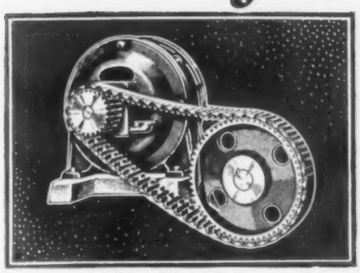
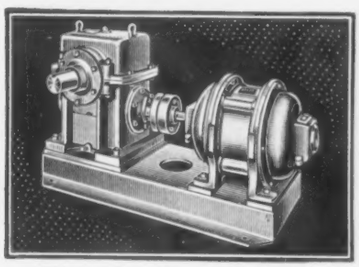


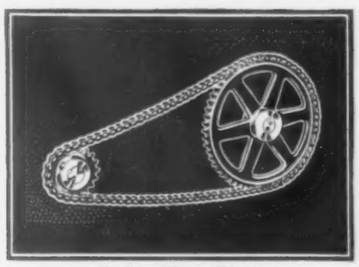
P. I. V. Gear
(Variable Speed Transmission)



Silent Chain Drive



Worm Gear Speed Reducer



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LINK-BELT makes it easy for you to secure the one drive that will serve best under any given condition. Furthermore, Link-Belt is ever ready to help you in your selection, and is in a position to offer unprejudiced recommendations, based on a long and successful experience.

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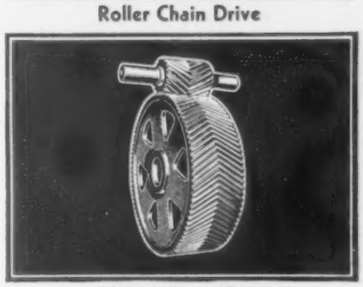
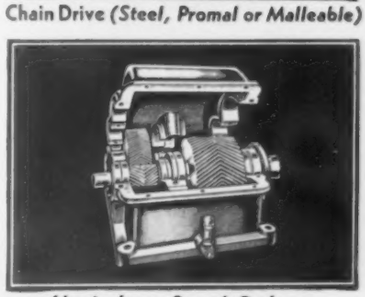


Herringbone Gear

Chain Drive *(Steel, Promal or Malleable)*



Herringbone Speed Reducer

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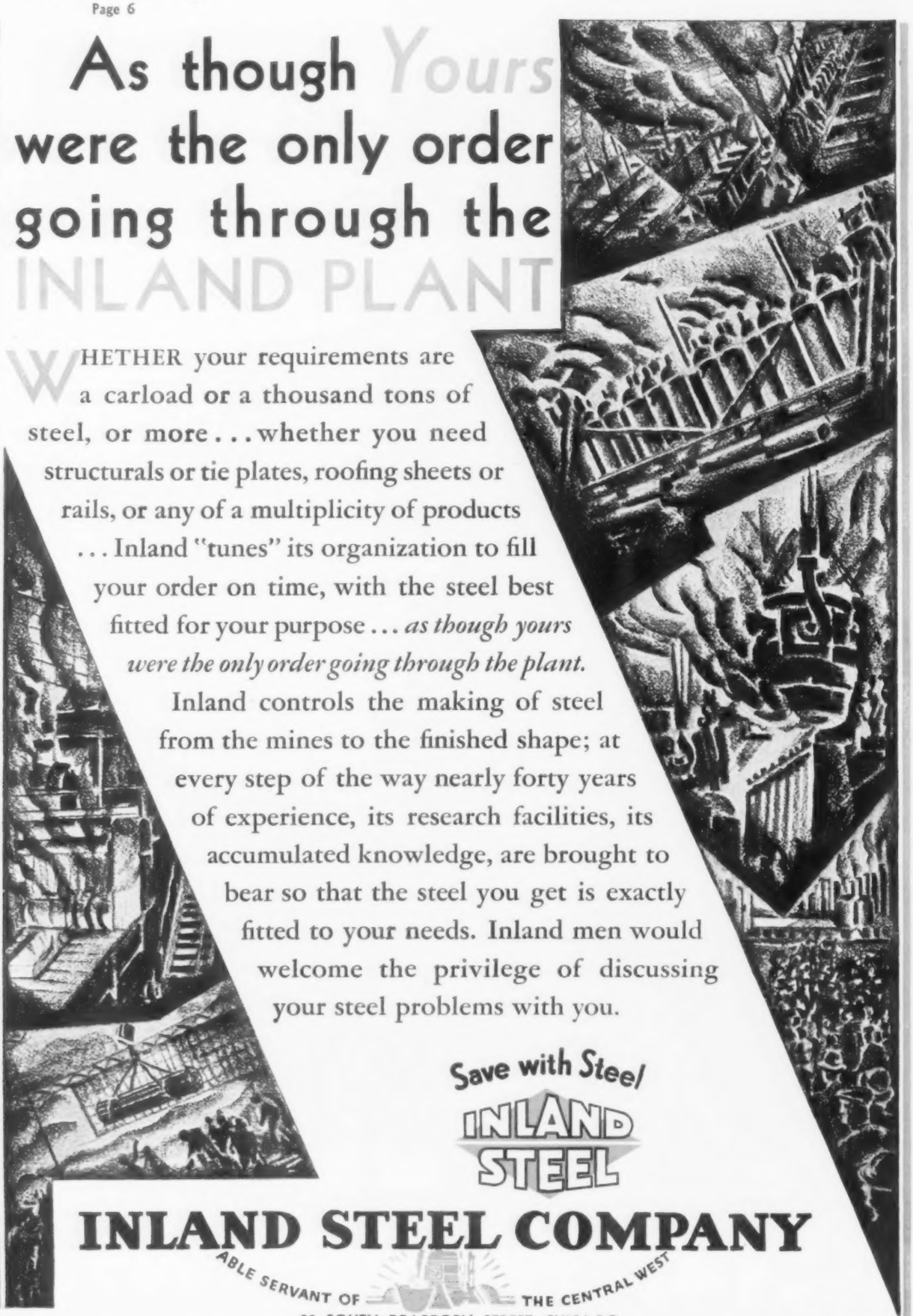

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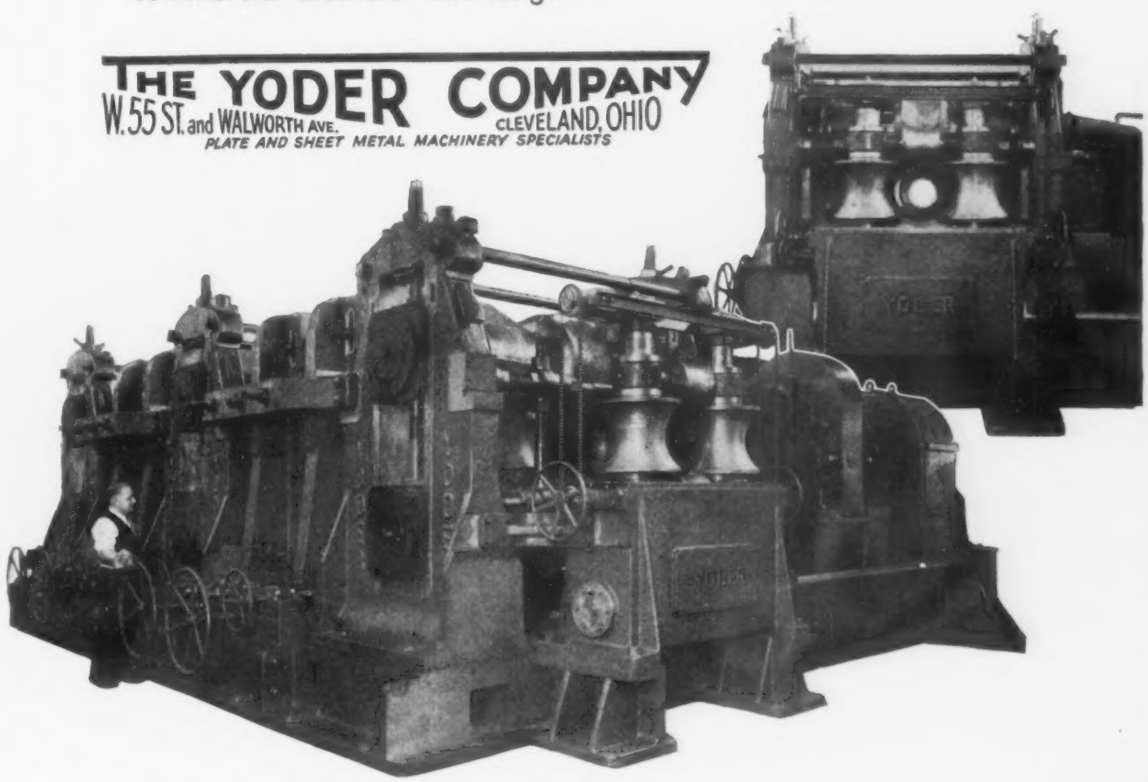

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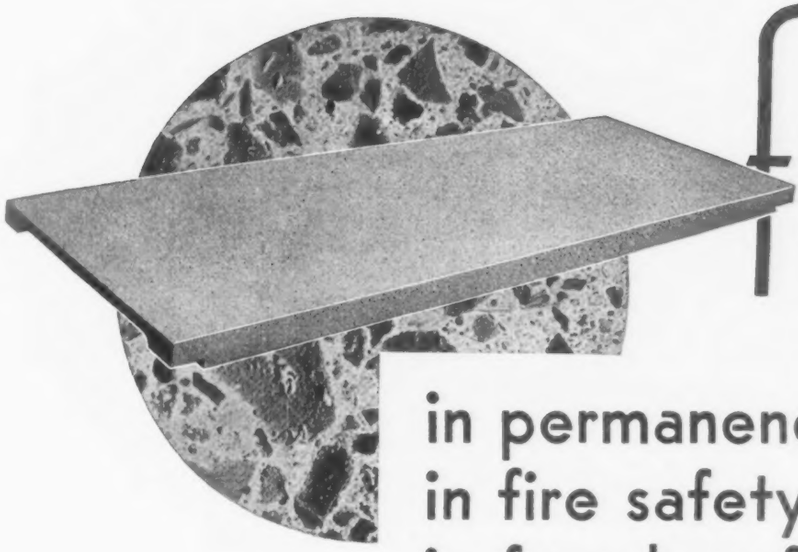

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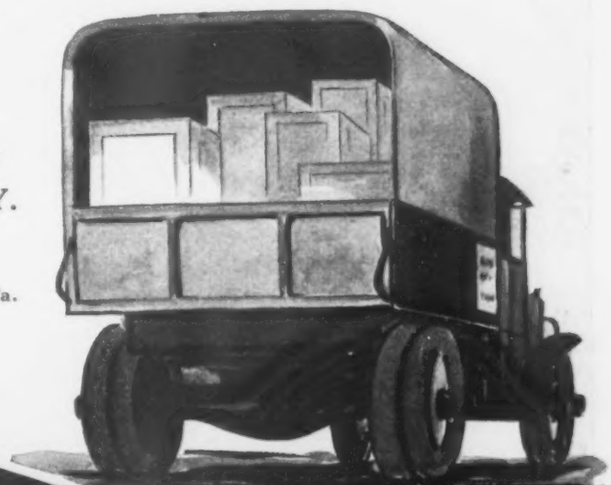
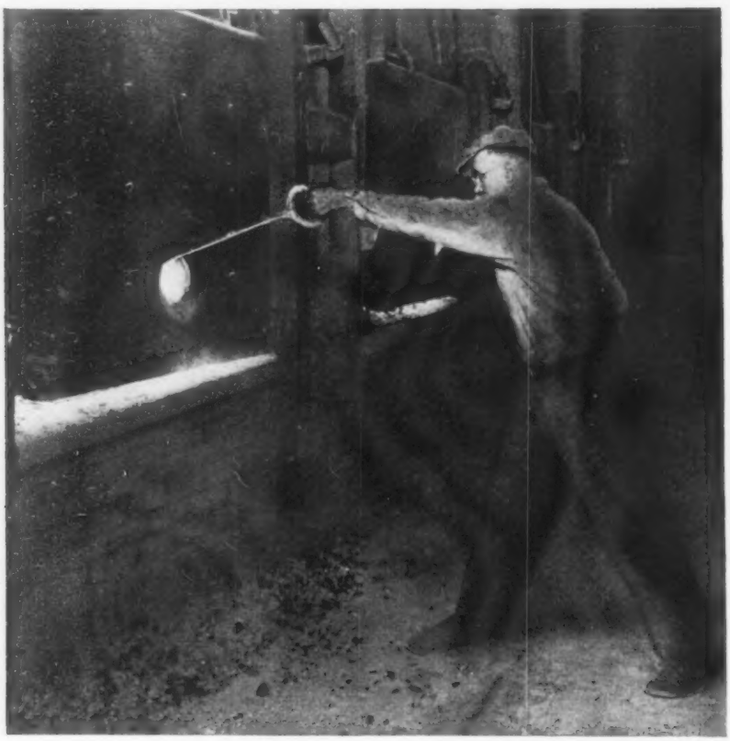


MAYARI NICKEL-CHROMIUM STEELS

ENDURANCE

THAT SURPASSES ALL EXPECTATIONS



The introduction of Mayari Nickel-Chromium Steels many years ago marked the beginning of a new era in the making of steels to withstand shock and fatigue. These, the first nickel-chromium steels to be used, were found to have an unusually desirable combination of the qualities that make for long life in parts subjected to severe usage.

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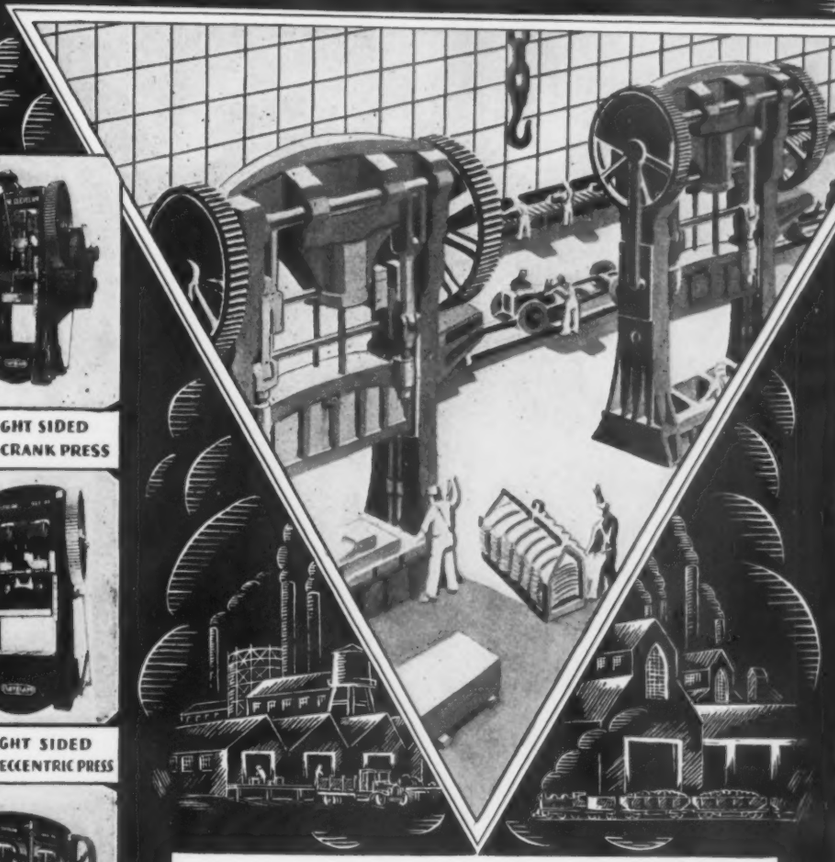

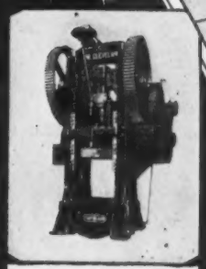

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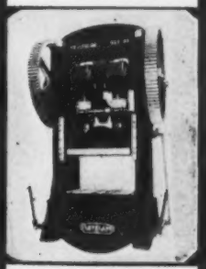

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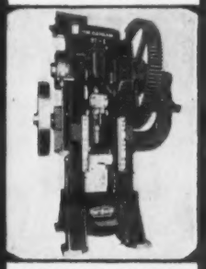
DOUBLE ECCENTRIC PRESS

STRAIGHT SIDED
DOUBLE CRANK PRESS



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A LOCOMOTIVE BUILDER WHO

..changed his finish specification
..got a better product, and
..saved 31 cents a nut

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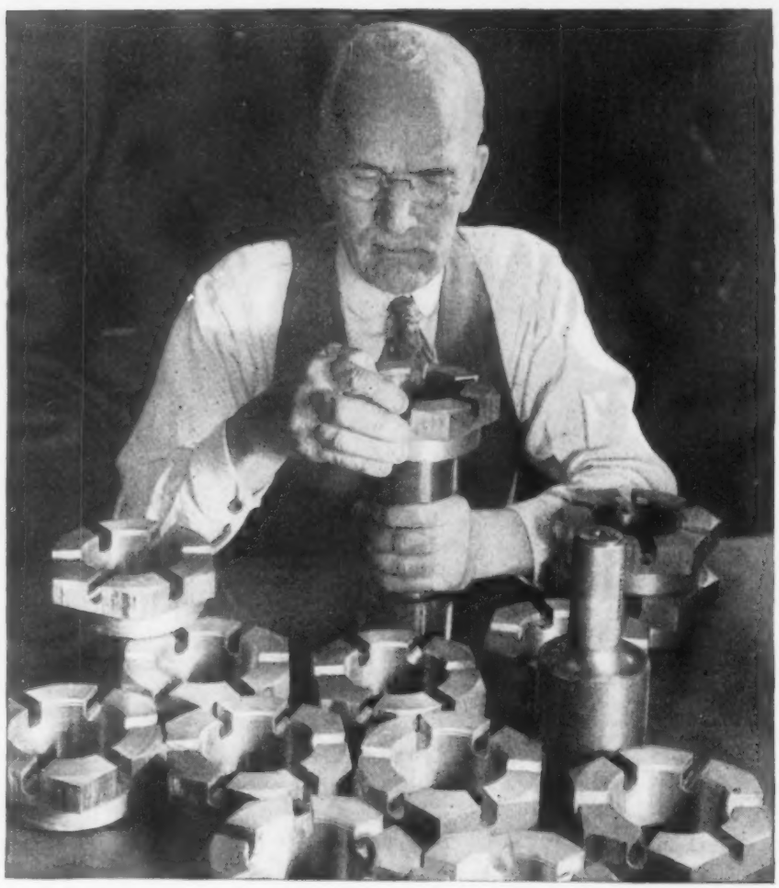

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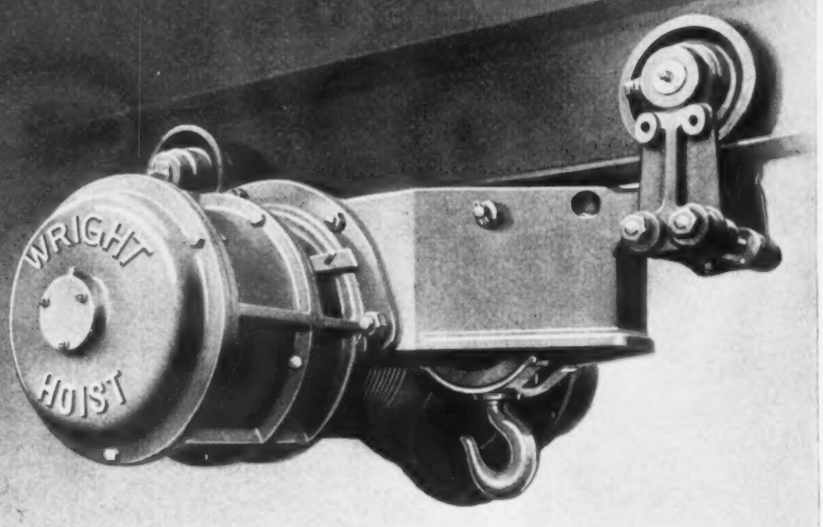
WRIGHT

ELECTRIC HOISTS

· FOR MINIMUM HEADROOM ·

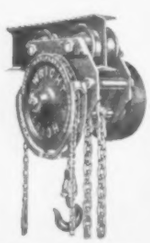


OTHER WRIGHT PRODUCTS

Type "W" Electric Hoist

High Speed Chain Hoist

Timken Roller Bearing Trolley



Army Type Low Headroom Hoist

THE Wright "WH" Electric Hoist meets very limited headroom conditions. The 1 ton hoist requires only 13 inches headroom below the runway beam. The ½ ton hoist requires 11 inches.

This small amount of headroom is obtained without decreasing the ample size of drum or sheaves, eliminating excessive cable wear.

Let us give you complete information—send for the Wright Electric Hoist Catalogue.

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ENGINEERING SERVICE

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YOU CANNOT REALIZE THEIR VALUE UNTIL YOU TRY THEM.

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BARNES MADE

Screw Machine PRODUCTS

to special specifications
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Any material up to 1¼" diameter

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Extension, Compression,
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also Wire Forms and
Small Stampings
of steel
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In any quantity 1 or 1,000,000

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QUALITY RAYMOND MFG. CO. CORRY ~PA. SPRINGS

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SUITABLE SPRINGS

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may we quote?

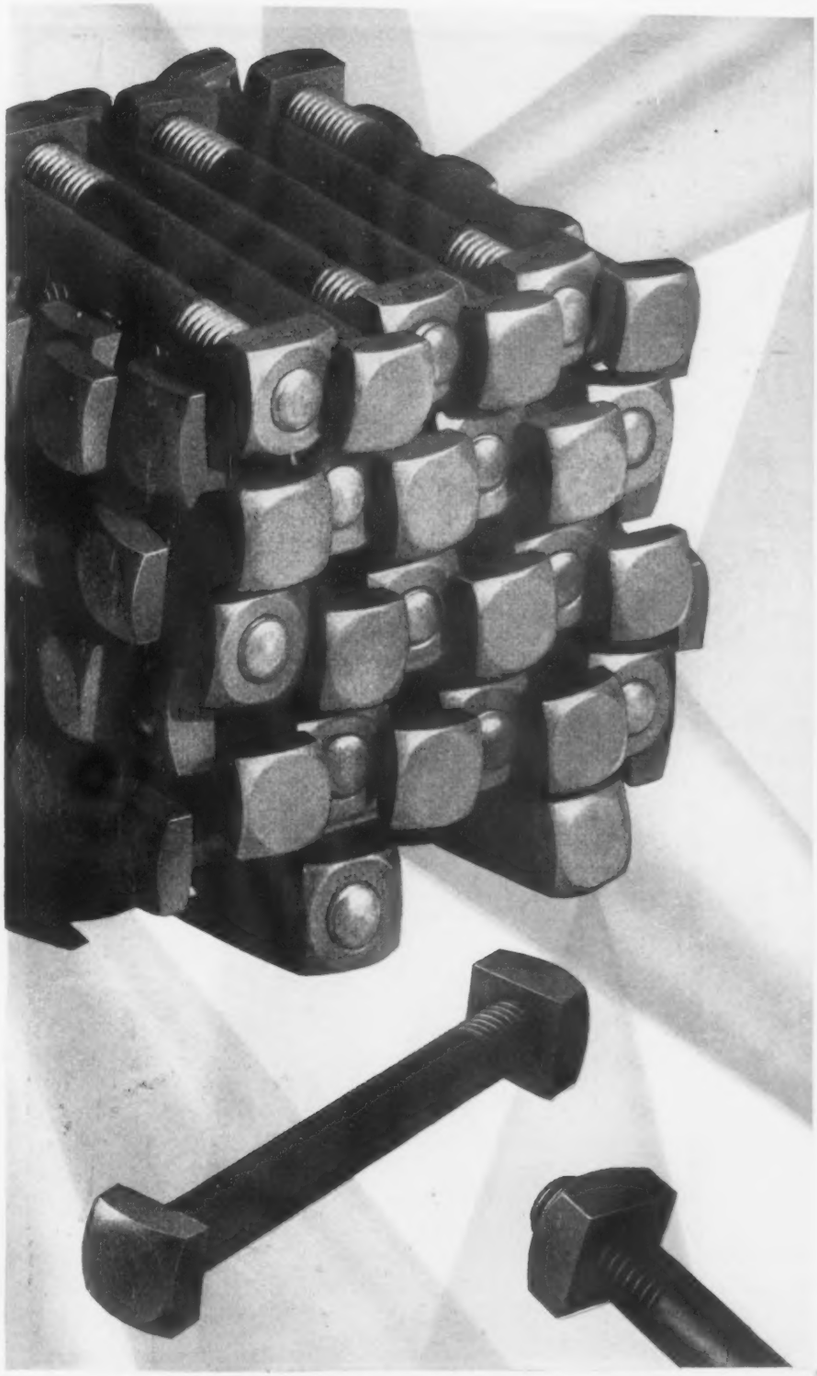
Two Plants for Spring Service

COOK SPRING CO. DIV.
ANN ARBOR, MICHIGAN

BGR INC.

DETROIT DIVISION
6400 MILLER AVENUE

BARNES-GIBSON-RAYMOND-INC



LAMSON bolts are always of finest quality . . .

For 66 years Lamson & Sessions' reputation for making bolts and nuts of extraordinary accuracy and fine finish has been carefully protected by unceasing vigilance in every department of manufacture. Today, although all five Lamson plants are completely equipped with the most modern machinery—there is closer supervision of operations to maintain quality than ever.

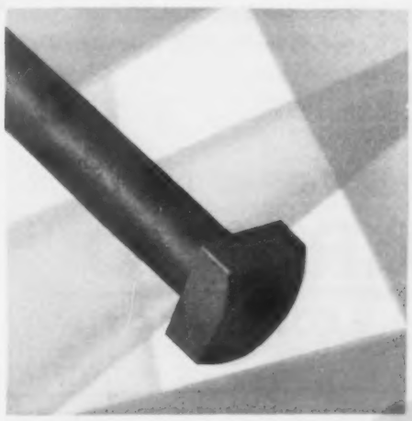
Quality is no meaningless catchword to Lamson customers. To them Lamson quality means uniformity, in gauge-like accuracy of threads and finish. It means high tensile strength of known dependability. To bolt users it means faster, better assemblies and, because of careful packaging, more orderly stock rooms.

Five big plants insure immediate shipments to meet conditions imposed by small inventories.

LAMSON & SESSIONS CO.

CLEVELAND, OHIO

Plants at Cleveland and Kent, Ohio; Chicago and Birmingham



Grueling Punishment

Hour *after* Hour

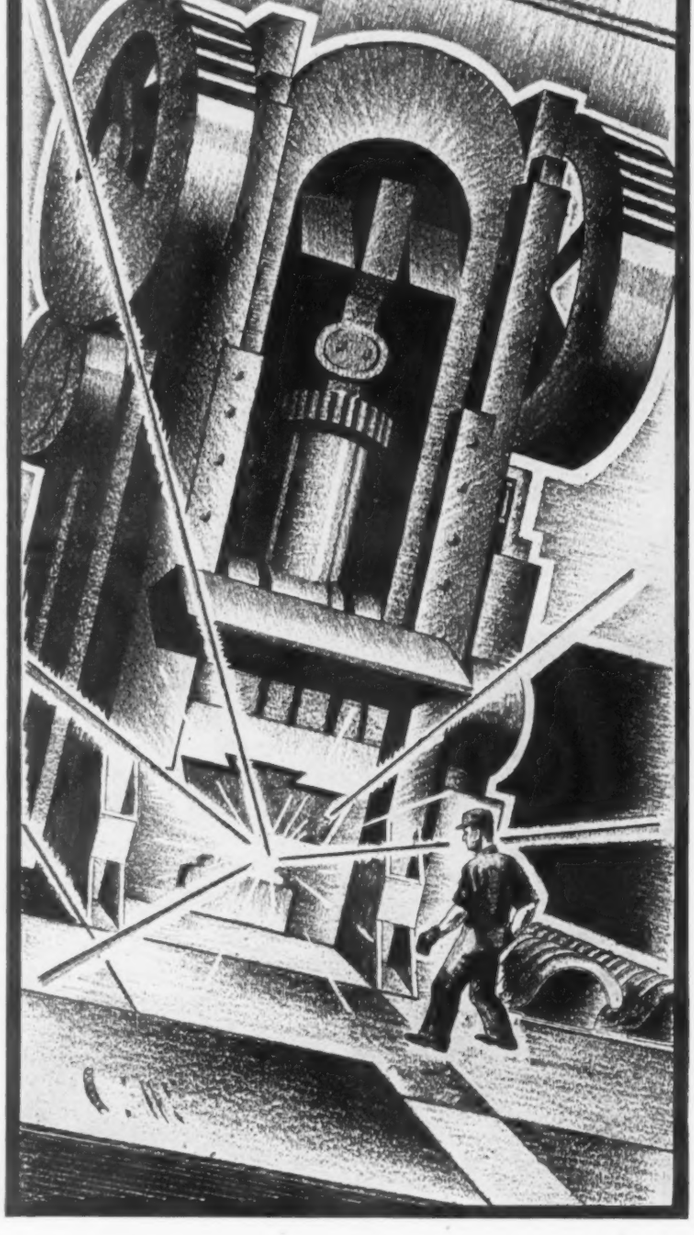
. . . yet these special sheets formed precisely with little breakage

ROW upon row of huge presses driving down relentlessly on thin blanks of steel . . . revealing in crushing impacts their freedom from hidden weaknesses and flaws.

Sheets of Armco special analysis iron and steel are being fed into the great mouths of these mighty automatons. Day after day they are subjected to this punishing treatment that rejects all but the fit.

Wherever there are hazards in drawing intricate shapes from highly finished sheets, Armco can help you attain a profitable percentage of perfect pieces. Its long experience, trained organization, and highly mechanized continuous mills are assets that can yield you gratifying dividends in efficient and economical production.

An experienced Armco engineer will gladly study the individual needs for every product or part. Ask the office nearest you for the services of this specialist in sheet and plate metal.



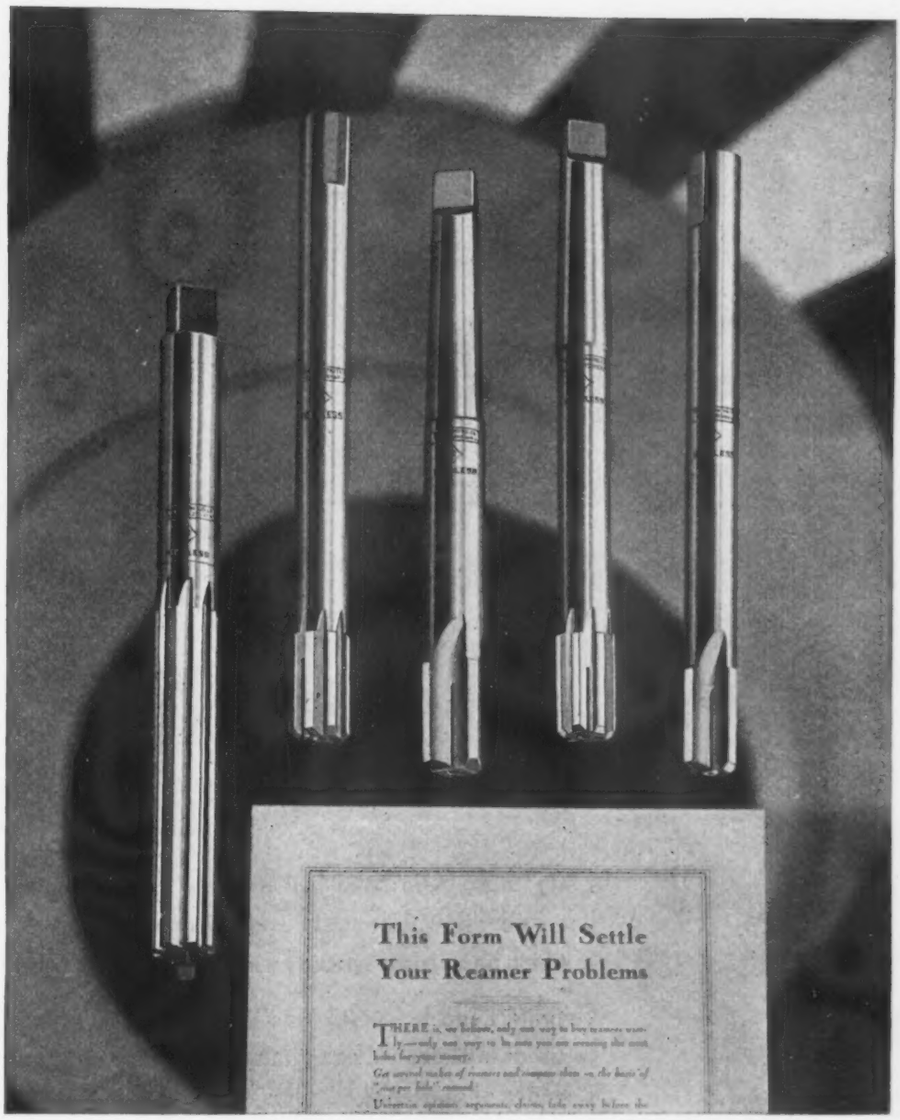
THE AMERICAN ROLLING MILL COMPANY
Executive Offices, Middletown, Ohio
Export: The ARMCO International Corp.

District Offices
Chicago — Cincinnati — Cleveland — Detroit — New York
Philadelphia — Pittsburgh — St. Louis — San Francisco

PRODUCERS OF
ARMCO IRON AND STEEL SHEETS
FOR EXACTING PURPOSES

ARMCO

PIONEER PRODUCERS OF SPECIALTY SHEETS AND PLATES



If you spend $100 a year for reamers . . .

read this carefully

Shop superintendents and purchasing agents everywhere are saving money on reamers through amazing facts brought out in a "cost-per-hole" test. They buy fewer reamers. They get more holes from each tool. And at a lower *cost per hole.* One shop which formerly spent $129.72 per year for reamers now does the same work for $5.59 (details furnished on request). In another shop, yearly reamer costs have been reduced from $230 to $38.50. Many reductions have exceeded 75%. You can make the "cost-per-hole" test yourself—in your own way. The form we supply makes the method simple. Hundreds of firms have requested copies. Yours will be mailed without the slightest obligation. See coupon below.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 BEADE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 656 HOWARD ST. SAN FRANCISCO
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Without obligation, mail me your "Cost-per-Hole" Reamer test forms and details on how the test is made.

Name _____

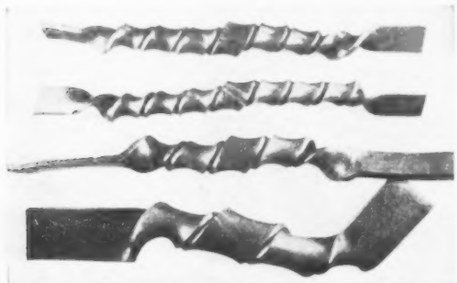
Company Name _____

Address _____

© 1931 by The Cleveland Twist Drill Co.

WHY REPUBLIC *ELECTRIC WELD* PIPE WITHSTANDS PUNISHMENT IN THE FIELD...

Tensile test on strip cut from Electric Weld pipe. Note the ¼ in. diameter notches at the weld. Break did not occur at weld.



Twist test with weld at right angles to axis of test strip. Two upper test pieces are from pipe 6-⅝ in. O. D. x 0.218 in. Two lower are 6-⅝ in. O. D. x 0.250 in.

Pipe A is 6-⅝ in. O. D. x 0.250 in. thick, expanded to 8-⅜ in. O. D. Pipe B is 6 in. O. D. x 0.156 in. thick, expanded to 8-3/16 in. O. D. Both are Republic Electric Weld pipe.

Twist test with weld longitudinal through center. Upper test piece is 1 3/16 in. wide and has been given seven twists; lower is 1-½ in. wide, given four twists.

Vanstoning quality of electric weld pipe 6-⅝ in. O. D. x 0.250 in.

Only those who have had intimate contact with pipe line work know the variety and the extent of the stresses to which line pipe is subjected in use and during handling.

Engineers and field men who know from experience the value of high tensile strength and ductility, and the advantages of uniform wall thickness and proven welds, will be interested in the results of the tests illustrated here.

While the usual hydrostatic and crushing tests are sufficient for the protection of the buyer in routine pipe production, these "abuse tests" are of value, illustrating as they do the unusual qualifications of Republic Electric Weld pipe, proving its strength of metal and weld, its ductility, its working qualities and its ability to take punishment in the field. *Details gladly mailed on request.*

REPUBLIC STEEL
CORPORATION
GENERAL OFFICES: YOUNGSTOWN, OHIO

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CLUSTER GEARS

made the "AMFORGE" way
have
GREATER STRENGTH
—more economical

Forging Weight 40 lbs.

The cluster gear blank shown here is only one of many sizes made by AMFORGE. Upset Forged Cluster Gears are forged in one piece, from a single bar of steel of any analysis—any size—any quantity.

Upset Forging produces a radially upset grain —giving all teeth the maximum breaking strength.

Let us send you this booklet that fully describes AMFORGE Upset Forgings.

AMFORGE

AMERICAN FORGE CO.

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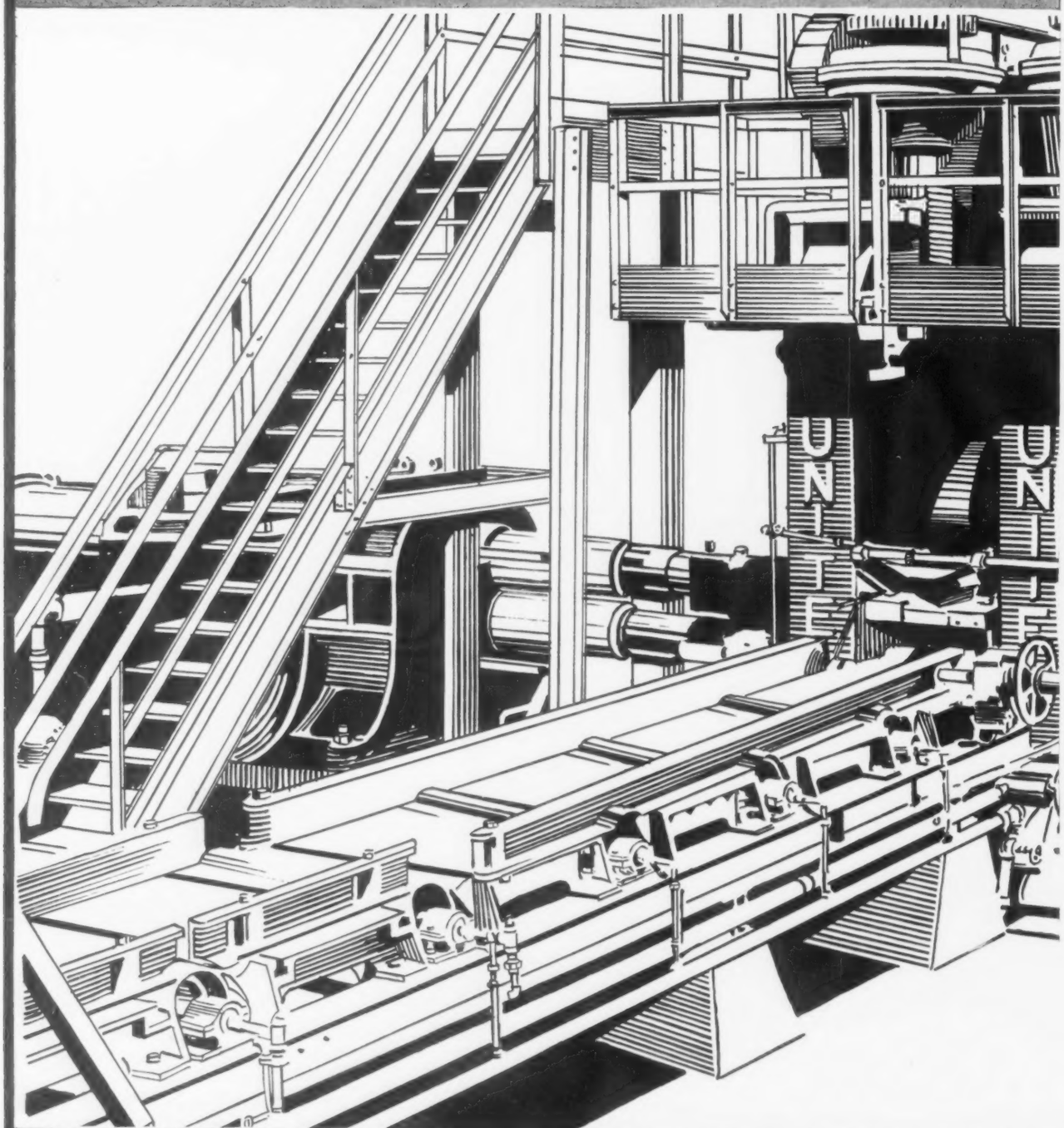
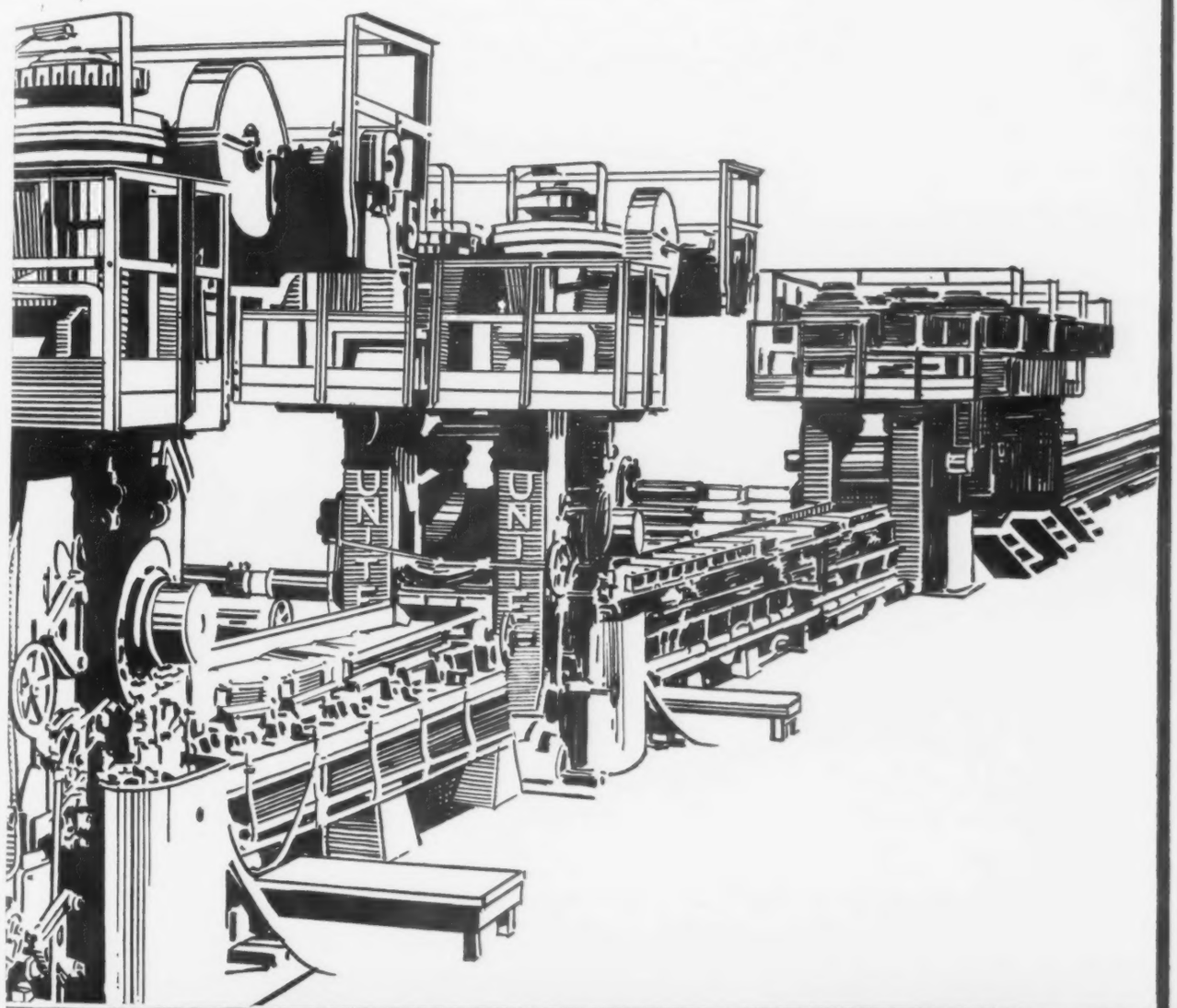
4-HIGH CONTINUOUS
Hot and Cold Strip Mills
Originated and Developed by
UNITED

15 UNITED installations now in operation or in process of building



THE WORLD'S LARGEST MAKER OF



UNITED

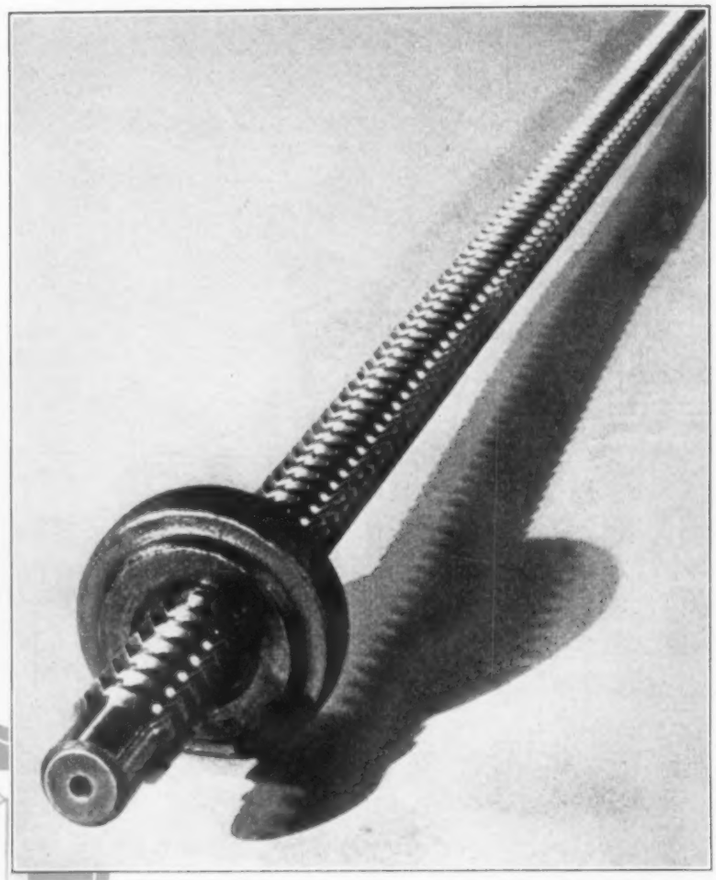
ENGINEERING *and* FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

ROLLS AND ROLLING MILL EQUIPMENT

EX-CELL-O BROACHES

Bring a New Degree of Precision and Efficiency to This Important Production Operation



There are many diversified applications to which broaches may be applied. They are especially adapted to the finishing of square, rectangular, or irregularly shaped holes. They are also adaptable to a wide variety of miscellaneous work such as the cutting of single or multiple key ways, hubs, splines, cutting teeth, small internal gears, ratchets, etc.

THE most modern and precise equipment for internal, external, and surface grinding; a heat-treating plant employing the most advanced electrically-controlled heat-treating equipment; and inspection facilities which detect the slightest error, enable Ex-Cell-O to hold to the highest degree of accuracy in broaches and fixtures; to insure long life and to reduce breakage to a minimum. ¶ Ex-Cell-O Broaches are supplied in either push or pull type, for either external or internal broaching—all lengths, all shapes. Made exclusively to the purchaser's specifications.

1200 OAKMAN BOULEVARD · · DETROIT, U. S. A.

EX-CELL-O
AIRCRAFT & TOOL
CORPORATION

OTHER EX-CELL-O PRODUCTS

Ex-Cell-O also produces drill jig bushings, internal grinding spindles, multiple drilling equipment, milling cutters, ground form tools, gear shaper cutters, counterbores, diamond boring machines, special machines, tool details, gears, aircraft engine parts, Diesel fuel pump parts, XLO-Carboloy faced tools, automatic machine work.

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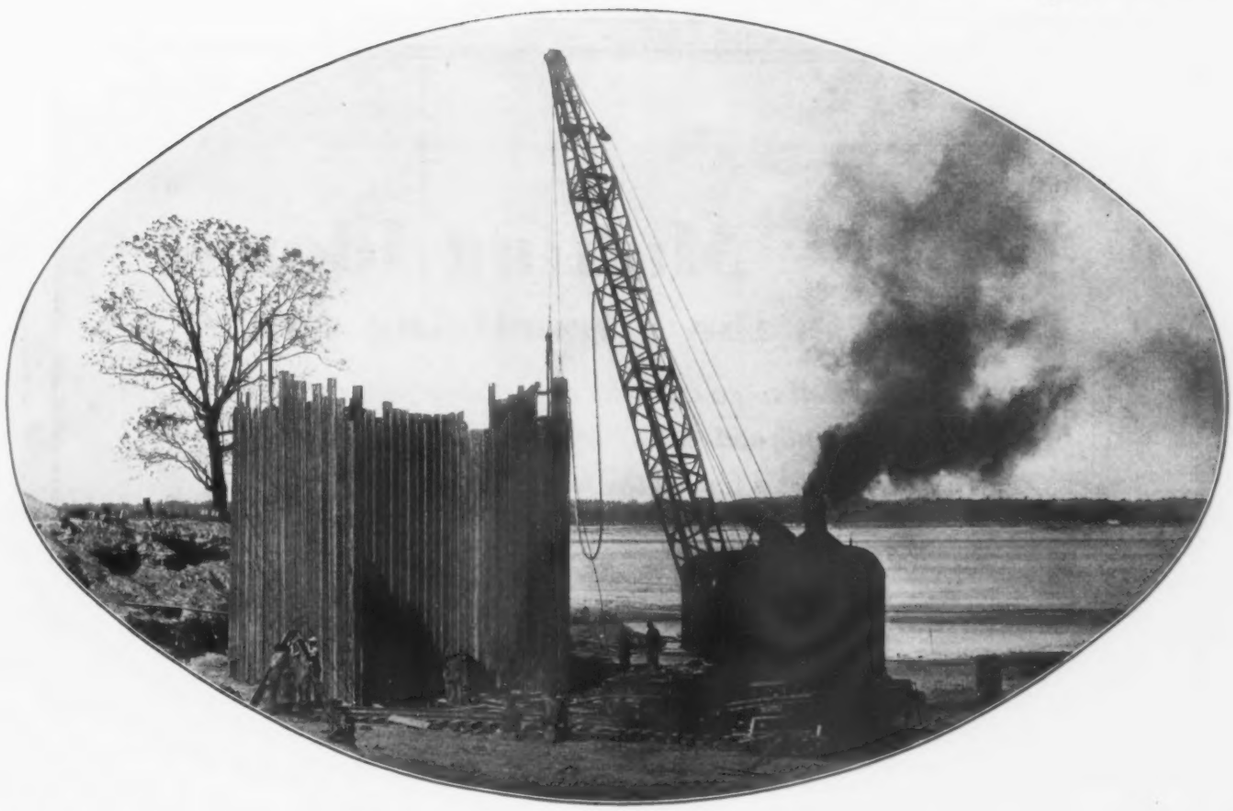


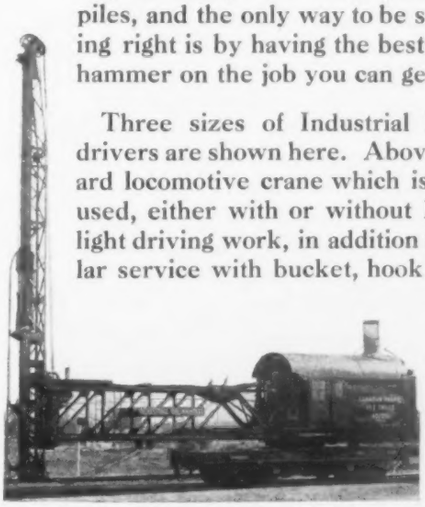
Having a Good Driver Is Half the Job

Well begun is half done. This saying is particularly true when you are driving piles, and the only way to be sure of starting right is by having the best driver and hammer on the job you can get.

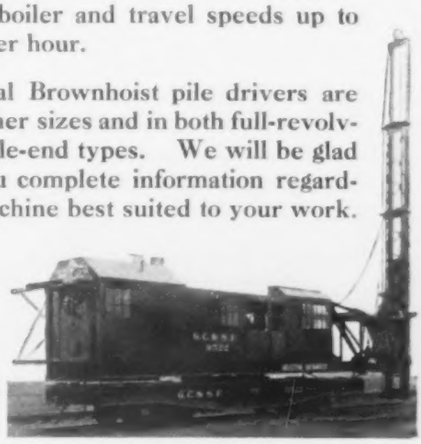
Three sizes of Industrial Brownhoist drivers are shown here. Above is a standard locomotive crane which is commonly used, either with or without leaders, for light driving work, in addition to the regular service with bucket, hook or magnet.

The illustrations below show two heavy-duty, full revolving drivers. Both are suited for either straight or batter driving and the machine at the right has a locomotive type boiler and travel speeds up to 20 miles per hour.

Industrial Brownhoist pile drivers are built in other sizes and in both full-revolving or single-end types. We will be glad to give you complete information regarding the machine best suited to your work.



Industrial Brownhoist steam pile hammers are double acting, using steam to raise the ram as well as to increase the force of the down stroke. These hard, rapid hammer blows are much more effective than those of single acting or gravity drop hammers.



Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.
Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division. Elyria, Ohio.

INDUSTRIAL BROWNHOIST

Money Making Ideas

for you in the advertising pages

It will pay you well to go over the advertising pages carefully. They are packed full of valuable information. Just a few of the high spots—

A 14% increase in power factor (from 77 to 91%) was achieved recently by a Milwaukee plant. **Page 105.**

Collapsible tap on unusual job cuts a 3 7/16" dia. thread, 8 pitch, 25" long in seamless tubing. **Page 32.**

Locomotive builder saves 31c. a nut. **Page 16.**

A shop that spent $129.72 for reamers per year now does the same work for $5.59. **Page 23.**

Form-turning jobs that formerly took from 4 to 8 hours can now be turned out in an hour or less. **Page 41**

New hydraulic feed cold saw that cuts up on the work, instead of down, will cut a .70 carbon steel bar, 5¼" dia., in 2⅓ min. **Page 43.**

New fast-stroke hydraulic press provides quick die contact. **Page 69.**

"One-third of industrially owned track scales are inaccurate." Guard against light weight. **Page 106.**

Chilled iron rolls turn out 71,000 billets of 250 lb. each over a period of four months without refinishing. **Page 93.**

To get the rigidity needed in high production multiple drilling, upright drilling machine has an auxiliary slide on the column to support drill heads. **Page 39.**

New machine sizes and straightens 16 to 26" o.d. pipe at rate of 100 ft. per min. **Page 7.**

Proper buffing brings out full beauty of stainless steel and rustless iron. Different parts need different buffing compositions. **Page 73.**

A record! Without relining, a blast furnace ran 10 days less than 10 years, making 1½ million tons of iron. **Page 87.**

New resistance welder welds spokes to rim of automobile steering wheels at rate of 300 wheels per hour. **Page 64.**

Material being screened cannot slide over surface of new perforated slide due to edges of the openings, which catch and turn pieces over. **Page 143.**

Hermetically-sealed chuck can be used continuously for several years without cleaning or repacking. **Page 114.**

Jig borer gives visible accuracy at every moment while work is being bored. **Page 49.**

Time for cleaning parts, preparatory to enameling, cut in half by gas range manufacturer. **Page 50.**

Strip cut from electric-welded pipe withstands seven twists without weld fracture. **Page 24.**

Are you machining parts that could be cut from bars drawn to your specifications? **Page 144.**

Grinding wheel speed stepped up to 9,000 s.f.p.m. **Page 53.**

A belt that lasted 30 days on a particularly severe application was replaced by one that ran over 4½ years. **Page 97.**

Several ways to cut handling costs in the foundry, by using a bucket, are illustrated on **Page 86.**

Which of the oven designs diagrammed on **Page 71** meets your requirements?

Casting rejects are reduced by proper sand preparation. An interesting layout is on **Page 76.**

If you are having trouble with cast parts in severe service, read **Page 78.**

Production costs were cut 30% by using the pressed steel part shown on **Page 80.**

Vibration and strain on bearings and spindles of your grinding machines can be reduced. **Page 57.**

High manganese does not necessarily mean low machinability. For a high manganese, free-cutting screw stock see **Page 104.**

For a handy little device that will help you get exact cost figures see **Page 139.**

If parts wear out within five years a spur gear hoist maker will replace them free. **Page 116.**

Page 119 tells how to counteract high sulphur in acid-resisting castings.

If you have the problem of separating sand from annealed castings **Page 126** will tell you how you can cut the cost.

A new medium-duty, medium-priced flexible coupling is illustrated on **Page 96.**

A cog-belt's "innards" are revealed on **Page 98.**

Human eyes see best (high production, less spoiled work, better morale, etc.) in a soft, cool glareless light. **Page 51.**

When a lifting magnet "goes bad," profits sneak away disguised as costs. **Page 85.**

You can save steel in super-structure by using a new, light-weight, insulated, fireproof roof slab. **Page 9.**

These are just a few of the ideas for reducing your operating costs and improving your product, found in the advertising pages. There are many more.

It pays to read the advertising.

HORSE HEAD
UNIFORM QUALITY ZINC
FOR DIE CASTINGS

COSTS DECREASED through quantity production and **SALABILITY INCREASED** through attractive finishes determine the success of novelties and accessories.

The favorite production method today for novelties and accessories—die casting with Horse Head Zinc Alloys—decreases costs as quantities mount, and provides exact replicas which take any desired finish.

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET (New Jersey zinc) NEW YORK CITY

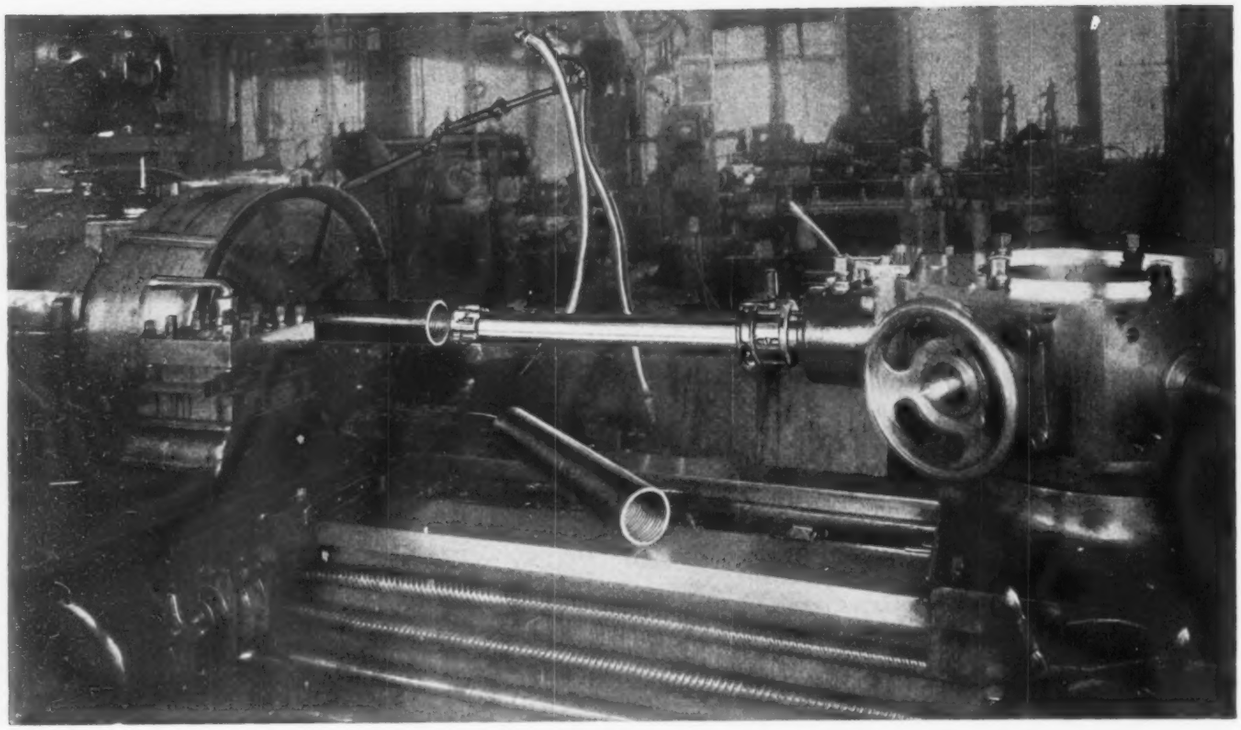
Zinc Metal and Alloys • Rolled Zinc • Zinc Pigments

Sulphuric Acid

Spiegeleisen

Every month new die castings

APRIL



SPECIAL TAPS *for the* *Unusual Jobs!*

Meet your unusual jobs with unusual tools. A special Victor Collapsible Tap with extended body solved this extremely difficult tapping job —a 3 7/16″ diameter, 8 pitch, U. S. F. thread, 25″ long in seamless tubing.

Victor Collapsible Taps lend themselves to the unusual jobs—long, straight threads — short threads located at the bottom of a deep hole—threads of like pitch in tandem, etc.

Ground thread form guarantees accuracy and long life. Radial relief reduces chaser friction, permitting greater speed. Collapsible feature saves time and prevents torn threads.

Submit your tapping problems—usual or unusual—our engineers will solve them for you.

LANDIS
REG. U.S. TRADE—MARK PAT. OFF.

LANDIS MACHINE COMPANY, INC.
WAYNESBORO, PENNA.

DETROIT OFFICE—5928 SECOND BLVD.
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LANDIS *for* THREADING

THE IRON AGE

April 2, 1931

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THE SUCCESSFUL BUSINESS PAPER MUST HAVE "E. A."

NOT so many years ago little thought was given to eye appeal in publishing business papers. "Why should a man have to be enticed into reading what is intended for his own good?" the old-time business paper editor would snort. He spent little time or thought on "make-up," and his rules were few and simple: fine type, plenty of it; small illustrations, if any.

But today's business paper editor realizes that what he puts into his publication must not only be helpful to subscribers; it must also be attractively presented, so that it will invite the reader's eye. Extremes in typographical arrangement must be avoided, for they distract the eye and discourage reading.

The Iron Age, a leader in the movement toward improved editorial "dress," has been called one of the country's handsomest business papers. A prominent official of the Department of Commerce told us a few days ago, "The Iron Age is the most attractive business paper that comes to my desk. It is arranged in such a way that I find it unusually easy to read."—A. H. D.

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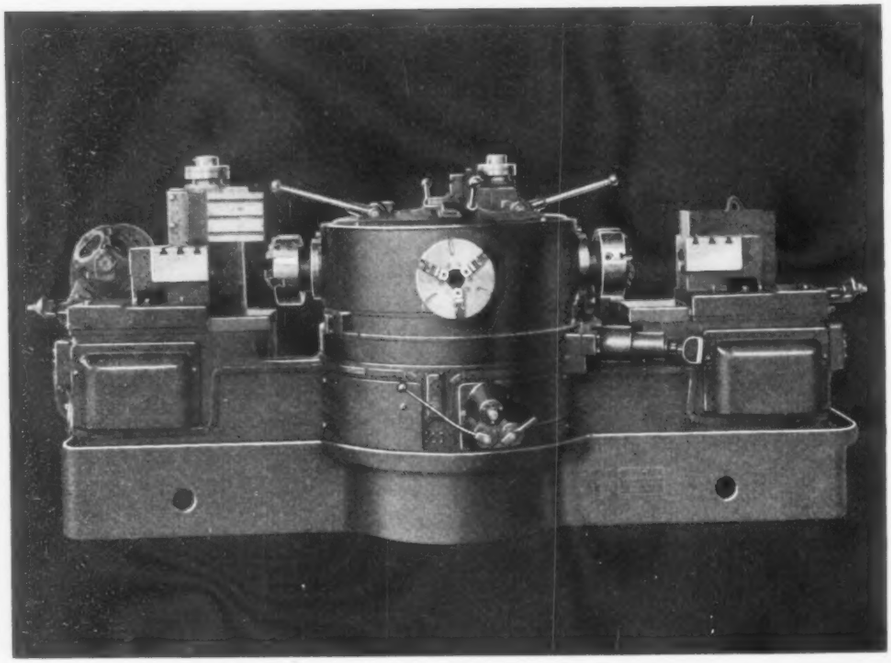
76th IRON AGE YEAR



In the modern spindle bearing

. . . nothing rolls like a ball

1707

Three essentials to good spindle performance are accuracy, rigidity and speed ability. The Goss & DeLeeuw Machine Company's Quad-Radial chucking machine is possessed of all three and the means for retaining them, because New Departure Perfex Ball Bearings carry its four main spindles. These bearings are pre-loaded during installation so that positive ball to race contact exists under all working conditions. Accuracy and rigidity must follow. Speed ability exists because friction is so low . . . low because of New Departure's precision and absence of any need for forced alignment of rolling members, since nothing rolls so freely, so naturally as a ball. New Departure engineers will be glad to discuss the advantages of Perfex spindle bearings in many successful applications or as they specifically apply to your machines. The New Departure Mfg. Company, Bristol, Connecticut; Detroit, Chicago, San Francisco.

NEW DEPARTURE BALL BEARINGS

THIS ISSUE IN BRIEF

APRIL 2, 1931

NEXT WEEK

WEALTH has always been an object of attack. It has caused wars, revolutions and ceaseless political agitation.

Industry regards it as futile to quarrel over the distribution of wealth when man has it in his power to produce such an abundance that no one need be dissatisfied.

Nothing gives so much promise of definitely ending the age-old conflict between the "have-nots" and the "haves" as the remarkable progress in mechanical handling methods. How rapidly the machine, in its many adaptations, is multiplying the power of man to create wealth will be indicated by a comprehensive array of recent improvements in materials handling equipment next week.

Dole Deficit Is Close to $375,000,000

From a surplus of $110,000,000 in 1920, British insurance fund has run up a deficit of more than three times that amount, and the debt is growing at a rate of $5,000,000 weekly.—Page 1069.

* * *

Are Wholesale Wage Reductions Impending in England?

So far organized labor has resisted wage cuts. But with ten years of depression and unemployment, failure of "the dole," high taxes, declining stock prices and no relief in sight, important changes seem imminent.—Page 1073.

* * *

Welded Steel Construction Popular in Germany

Regulations governing design of welded structures, promulgated by the Prussian Ministry of Safety, stipulate lower base stresses than those permitted in American regulations.—Page 1074.

* * *

Forging Nitriding Steel

This steel forges best between 2150 and 2250 deg. F. It flows freely and is unusually free from cracks or tears.—Page 1080.

* * *

To Avoid Distortion, Normalize Before Nitriding

Unless strains are removed by normalizing, the steel will warp during nitriding. Distorted parts can be straightened, but they may not remain straight.—Page 1080.

* * *

Uses Ceiling as Stockroom

Monorail with chain booster lifts parts carriers to ceiling, where parts may be stored between various points in the assembly process.—Page 1086.

* * *

Monorail and Glide-Type Switches Cut Costs Sharply

Without interrupting the flow of work, a refrigerator unit can be pulled off the main line, filled with gas and oil and inspected.

* * *

Finds Monorail Low in Cost, Highly Efficient

Cost of installation lower for area covered than other systems appeared to offer, says refrigerator manufacturer. Maintenance is low; short-radius curves can be made; floor space is saved; units can be conveniently switched into or out of main line.—Page 1084.

Much Weight Saved by Light Steel Flooring

Channel plates 18 ft. long, ¼ in. thick, ¾ in. crown, are bolted together along the webs. They are light, and can be erected speedily and economically.—Page 1089.

* * *

Fatigue Disappears at Elevated Temperatures

Apparently, at 750 deg. F. or over, fatigue has lost its importance as a factor. Therefore, fatigue and creep factors may be considered as opposites. As one decreases the other increases in importance.—Page 1090.

* * *

Metals That "Seize" and Tear Each Other

Under pressure, such as in valve seats, some metals will not slide smoothly. Cast materials "seize" less than forged or rolled metals. Two metals with much the same size of grain are likely to "seize."—Page 1092.

* * *

Work-in-Process Inventories Cut by Conveyor System

Rapidity of assembly and quick turnover has reduced raw material inventory of electrical equipment manufacturer 25 per cent.—Page 1096.

* * *

Conveyor Set-up Based on Sales Forecast

Maker of electrical appliances forecasts his sales and runs toasters, waffle irons, hot plates, etc., on the same conveyor set-up. Assembly labor has been reduced about 35 per cent.—Page 1095.

* * *

How Welders Are Examined in Germany

Fillet welds are made on two longitudinal sheets exactly vertical, one above the other, upon a horizontal piece, making a cross in transverse section.—Page 1077.

* * *

Conveyor Enforces Production Control

It eliminates the tremendous loss of time from lack of coordination. Work must flow from operation to operation in an orderly way and without delay. Each operation must be time-studied and lost motion eliminated.—Page 1095.

* * *

Nitrided Parts Do Not Hold Their Hardness Under Heat

The case begins to lose its hardness at heats slightly above nitriding temperature, and the loss increases as the temperature rises.—Page 1082.

BILLINGS *New* "VALULINE" *Wrenches*

Whether bought for maintenance, or given away as standard equipment with your machine tools, this new "VALULINE" will

Save You Money

Ask your Jobber, or talk with our nearest Branch Office or Representative:

The Billings & Spencer Company

53 Warren St., New York City (Warehouse Stock)
564 West Randolph St., Chicago " "
5-207 General Motors Bldg., Detroit, Mich.
Smith Tower, Seattle, Wash.
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..THE IRON AGE..

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UNEMPLOYMENT—An Ounce of Prevention Is Worth a Pound of Cure

THE trying experiences of our British cousins in attempting to cope with a whole decade of depression can be studied with profit by a country that has suffered little by comparison. Questions that we may well ask are: "What mistakes have the British made that we can avoid?" "What success have they had with measures that are now being proposed here?"

Social reformers now tell us that the enforced idleness of millions proves the need of State unemployment insurance. Yet, the British, eminently practical in political matters, thought of that long ago, adopting a contributory scheme under which worker, employer and Government jointly assumed the cost of an insurance fund. In 1920 the fund had a surplus of $110,000,000. Later it became necessary to pay benefits to unemployed who had been unable to make any contributions to the fund or had made only partial payments. As a consequence the insurance fund has now been overdrawn by close to $375,000,000 and the debt is still increasing at the rate of $5,000,000 weekly.

Instead of stabilizing mass demand and checking business recession, State insurance has proved a cumulative burden on the taxpayers of the nation, forcing Britain deeper and deeper into the morass of industrial stagnation. Belated efforts at rationalization whereby industrial workers would produce more and earn more have failed because their immediate effect was to further increase unemployment. Apparently the only way out of the dilemma is a reduction in wage scales—an acknowledgment of defeat in the struggle to sustain mass buying power.

The seriousness of the present crisis in British economic policy is indicated in the ensuing article by Charles M. Mills. Each reader can draw his own moral, but American management will doubtless conclude that no system of unemployment relief can succeed for long that permits consumption without commensurate production. American industry will see the folly of pouring millions of dollars into the sinkhole of subsidized idleness when the same millions could be used for productive purposes to provide employment.

How our productive processes can be kept moving in the face of cyclical forces is, of course, a difficult and complex problem. But American industrial executives will not rest until they find a solution. Their attitude toward unemployment is that an ounce of prevention is worth a pound of cure.

JOHN BULL TRIES TO MEND

By CHARLES MORRIS MILLS
Industrial Counselor, New York

ON Feb. 11, Philip Snowden, Chancellor of the Exchequer, gave a speech on the economic situation that literally shook Britain. He declared that grave and disagreeable measures must be taken to restore budgetary equilibrium and business. Since industry could not stand further taxation, he asked a temporary suspension of socialistic principles of the betterment of the masses, and inferred that extended wholesale wage reductions might take place, even among Governmental employees.

The effect of his speech had strange political reactions—the Labor group was split open by the seeming treachery of one of its leaders; the Liberals were amazed; the Conservatives frankly enthusiastic that one of the opposition party had spoken so courageously the word that had been needed for so long. British business, after the first flutter, relished the frank admission as clearing the murky atmosphere of ten years of depression and unemployment, merciless taxation, declining stock prices, disaster in shipping and finance, and a dominion slipping to the verge of bankruptcy.

The National Federation of Employers' Organizations, representing a membership managing over 7,000,000 wage earners, lost no time in recommending a reduction in the unemployment dole by one-third, a review of wages, and reduction of expenditure of social services. On the basis of English wages as 100, this association placed wages in Germany at 74, France at 59, Belgium at 50, and Italy at 45. With British taxation at 100, French taxation is placed at 64, German at 50, Belgian at 38, and Italian 30.

To the manifesto, Sir Oswald Mosley and others of his back-bench Laborites retorted that "the attack on the national standard of life" is impossible when "2,500,000 workers are prevented from producing" and "the home market is destroyed by wage reductions."

Snowden's speech is the culmination of a series of incidents that have stirred British industry in recent weeks. At the close of 1930, new peaks of unemployment were reached; the yearly export totals declined severely; productive capacity fell off 20 per cent from normal; disputes arose in coal mining and cotton weaving and on the railroads. At last Britain began to realize the situation was not temporary, but chronic. There was a growing appreciation that the prescription needed was surgical rather than medical. The attitude of "muddle through" changed to the necessity of "muddle out."

Before proceeding to an analysis of the trade disputes in the basic industries, a brief review of British wages, cost of living, employment and industrial relations will aid in focusing upon the issues involved.

Wages and Cost of Living

Wages, in general, in 1930 remained stable. The Ministry of Labor reported net increases in weekly full-time rates of $2,890,000, affecting 760,000 persons, and net decreases of $5,790,000, covering 1,100,000 workers. The final net decrease of $2,900,000 represented only one-quarter of one per cent of the total national payroll. Increases occurred among railroad and shipbuildiing workers, low-paid groups in steel melting plants and rolling mills, tin plate workers in Wales and Monmouthshire and workers for electrical contractors. About 80 per cent of the decreases came in textile and building groups.

Full-time weekly wage rates were 70 to 75 per cent above 1914. On the basis of the cost of living in the beginning of 1931, real wages were more than 20 per cent above pre-war levels—the purchasing power of the pound has increased by one-fifth.

The general cost of living, which was 67 per cent above pre-war levels on Jan. 1, 1929, and 1 per cent less the year previous, declined to 54 per cent above on

FENCES

WHETHER lagging in technique and management, suffering through too much blood-letting in the form of the dole or languishing because of international trade conditions beyond its control, Great Britain has reached a crisis industrially. Wage rates, which have remained largely unchanged, are now threatened with reduction, since recent efforts to raise production and earnings per man failed because they increased the already large number of unemployed. The implications of these developments for us are outlined by the author at the conclusion of this article.

Jan. 1, 1931. Between January and June, 1930, there was a drop of 12 points, followed by a rise to 57 per cent in July and August. The same level came in November, 1927, with a drop to 55 in December.

Food prices, which on Jan. 1, 1930, were 57 per cent above pre-war levels, dropped to 38 per cent, the lowest since Sept. 1, 1915.

Employment

The average number of insured persons in 1930 (aged 16 to 64) was 9,764,000, the lowest since 1926. The ratio of unemployed to insured was 16.1 per cent against 10.4 per cent in 1929. The proportion totally unemployed increased from 8.2 per cent to 11.8 per cent; the temporarily from 2.2 per cent to 4.3 per cent. In the textile industries, the increase was 323,000 or 28 per cent; in coal mining, iron and steel, engineering, shipbuilding and ship repairing, the increase was 287,000 or 25 per cent. The total number of unemployed men increased 773,000 or 76 per cent; women. 384,000 or 143 per cent.

By employment districts the changes were as follows:

RATIO OF UNEMPLOYED TO INSURED

	1929 Per Cent	1930 Per Cent
London	5.6	8.1
South East	5.6	8.0
South West	8.1	10.4
Midlands	9.3	14.7
North East	13.7	20.2
North West	13.3	23.8
Scotland	12.1	18.5
Wales	19.3	25.9
Northern Ireland	14.8	23.9
All Districts	10.4	16.1

Trade Disputes

There were 415 trade disputes in Great Britain and Ireland in 1930, involving a total of 309,400 persons, against 533,800 in 1929. A total of 4,404,000 working days was lost in comparison with 8,287,000 days in 1929, a reduction of 47 per cent.

In summary, 1930 reflected stable wages, a large decline in cost of living and retail food prices, fairly peaceful industrial relations and a tremendous increase in unemployment. The analysis of unemployment figures by industry and district showed that some radical steps for improvement were needed in the textile, coal mining, steel and allied industries.

Rumblings on the Horizon

With the long swing into depression, with falling exports, with declining costs in food and living, John Bull, even before the now famous Snowden speech, began to bestir himself. Where was reconstruction going to begin? How were foreign markets to be regained? Where did the fundamental causes lie? How could costs be reduced?

It was not surprising, therefore, to find capital and management seeking the way out. In textiles, in coal mining, on the railroads, strenuous efforts were undertaken by capital at the close of 1930 and since the beginning of 1931 to revamp industry on a new basis. Most of these steps have been predicated

on the reduction of wages. Management decided that with the large decrease in living costs in 1930 the time had come to face the situation frankly. With a substantial increase in real wages placing purchasing power of the wage earners' shilling at the highest point since prewar days, with a million more unemployed within the year, British vested interests turned to battle on the most controversial point of all—wages as the way out.

The Burnley Experiment

In July, 1930, the Government committee on inquiry into conditions in the textile industry criticized management harshly for its old-fashioned organization and technique and strenuously recommended reduction of production costs. As one of the first steps following this report, the Cotton Spinners and Manufacturers' Association and Federation of Master Cotton Spinners' Association announced the "more looms to a weaver" system or Burnley plan.

Back as far as November, 1928, the local manufacturers' group at Burnley announced a program of research into the lowering of production costs without resort to wage reduction or increasing working hours. Because of the cost of installation of automatic looms, the committee advocated a stretch out system of eight looms per weaver instead of the usual four looms. Wages were to be increased from 40 to 50 shillings per week, and weavers were to specialize on loom tending only. The incidental work of cleaning and oiling, weft and cloth carrying were to be given to other employees—a number which would equal the number of weavers who would be displaced, according to management.

The scheme was tried out for a year successfully. In the fall of 1930 the manufacturers voted to extend the system to 25 per cent of the total number of looms in the industry during the first year. Resistance was made by the Amalgamated Weavers' Association, supported by the Northern Textile Trades Federation. The latter refused on Jan. 5, 1931, to work in mills which had introduced the system. The Cotton Spinners and Manufacturers' Association then voted to lock out 300,000 operatives in their mills on Jan. 17. Efforts by the Prime Minister and other Governmental officials to mediate met with no success, and the strike continued into February.

The strikers contended that the new method would force many weavers into unemployment, and was in reality an under-cover method of wage reduction. Management pointed out that the new method gave an opportunity for higher wages, and was merely one move toward the rationalization of the export trade in piece goods—a business which shrank by one-third in 1930.

The strike continued into February without any signs of interruption when suddenly, on Feb. 13, the manufacturers' group decided to withdraw the lockout and the Burnley experiment and reopen the mills on Feb. 16. The reasons given were the warning by Chancellor Snowden previously in the same week, the opening of a big cotton exhibition in London on Feb. 16, and a gesture of good will toward the workers. The master cotton spinners further stated that new schemes for rationalization in the yarn trade would be discussed with the unions. So ended the Burnley experiment—a step aimed at cost reduction by means of more work per operative, higher wages for weavers, but presumably resulting in further reduction of personnel. In face of widespread idleness in the industry, the latter threat unquestionably forced the unions to their resolute stand.

The Coal Strike in South Wales

On Dec. 1, 1930, a new coal mining law became effective, one of the provisions of which legalized the 7½-hr. day instead of the customary 8-hr. day. In South Wales, the entire force of 150,000 miners struck in middle December because rates for the new working day were not on the old 8-hr. basis. The strike continued until Jan. 15, when the delegates of the South Wales Miners' Federation voted 169 to 72 to arbitrate the matter before the National Conciliation Board. In the meantime, wages were to remain on the old basis. In February, the board recommended that wages be continued without any reduction. The miners' union was reported to have made concessions in working conditions that partially, if not wholly, offset the increased cost of wages on an hourly basis. An agreement was signed on this basis to extend until January, 1934.

At least one thing is evident by reason of this struggle—the miners' union, even in the face of widespread unemployment, was powerful enough to stand against hourly reduction of wages, and in this contention it was supported by the National Conciliation Board. No reduction of wages for John Bull on this front!

The Railroad Situation

In December, the British railroads presented a demand before the railroad unions for a reduction of wages and revision of working conditions. The unions refused to accept these demands, and the case was then placed in the hands of the National Wages Board—upon which there is representation of the companies, unions and the public. The hearings before the board, held in January and February, are of pertinent interest to American business. There is considerable similarity to our own conditions in the arguments presented.

The case presented by the railroads included a reduction of $50,000,000 in wages and salaries for 625,000 regular workers, and $7,500,000 for 119,000 shopmen. Male wage earners were to be cut $1.44 a week, minimum weekly wages 5 per cent from $9.60; juniors and female wage earners, $0.72 weekly; adult male salaried workers, $50 to $75 a year; women clerks, $0.72 to $0.96 a week. Standard hours, 48 and otherwise, were to be worked as the company required, and were to include Sunday duty, if neces-

sary. Sunday and night duty were to be paid at regular rates if not in excess of the standard 48-hr. week. Overtime at time and a quarter was to be paid only in excess of standard hours. Allowances to salaried staff were to be consequently revised.

The contention of the railroad companies was based on: (1) Decline in traffic receipts due to diminished industrial production. Net receipts in 1929 were $22,000,000 below the figure set by the Statutory Railroad Rates Tribunal, and in 1930 $52,500,000 less than in 1929. Loss in ancillary business was placed at $4,500,000. The total receipts in 1929 and 1930 were $68,750,000 less than standard rates.

(2) Wages in 1930 were 120 per cent above August, 1914, rates for the operating group and 100 per cent for the supervisory group. These rates were set in 1919 at a time of high prices when the roads were under Government control, and had not been reduced since. On the other hand, wages in general industry are 70 per cent to 75 per cent above pre-war levels, and the cost of living stands at 53 per cent up. Total wages and salaries in 1913 were $235,000,000, while in 1929 they had increased 143 per cent to $570,000,000. The companies claimed on the basis of these figures that wage reductions were fair and in line with present-day conditions. If we may take the gross reductions asked by the companies to the total wage bill, the entire cut proposed amounted to less than 10 per cent.

The companies also pointed out the rigidity of operating conditions, principally in the demand that Sunday work be regarded as week-day labor. They also contended that truck and motor bus competition had seriously eaten into receipts and profits, and they had been unable to fight such competition.

The unions replied that the entire decline in receipts was to be taken from wages; that drastic reductions of expenditure have already reduced wages; that permanent lower wages should not be established in the midst of depression; that other economies could be effected in organization and operation; that the 48-hr. week exclusive of Sunday must be maintained.

A representative of the National Union of Railwaymen stated safety would be seriously threatened if the morale of workers were shaken by wage reduction; that there was a lack of promotion; that 100,000 railroad men earned less than $11.04 a week; that it was impossible for an unskilled laborer to live on the minimum requested of $9.23 weekly; that pre-war wages were not comparable, as they were too low anyway; that Sunday and night duty changes seriously reduce wages; that the railroads owned and controlled motor bus companies; that railroad personnel had been seriously reduced.

The representative of the locomotive engineers and firemen claimed that the 8-hr. day would be lost; that expenditures had decreased faster than receipts; that high dividends and high fees to directors were more a factor in costs than wages.

The companies' rebuttal was that only 20 per cent of receipts now goes to capital compared with 33 per cent in pre-war times, that revenues were far below standards set by the board, that the companies were not seeking to return to the pre-war 56-hr. week.

The decision of the National Wages Board, recently announced, reduces the wages of 140,000 railroad workers by 4⅞ per cent.

The Burnley experiment resulted in a status quo; the mining situation in a shortening of hours and increase of wages; the railroad dispute in a partial downward adjustment of wages. So far, therefore, in the midst of unemployment many times more serious than in the United States, wages have remained practically unchanged. Yet Snowden's declaration may be the lightning before the storm, and important changes may be just around the corner.

For us in America, the British situation may raise the following questions:

1. Should wages be reduced according to the decline in cost of living and prices? or

2. Should real wages be maintained, increasing the purchasing and consuming power of a large share of the population?

3. Are wage cuts the answer to the unemployment situation?

4. Should better technique and organization in industry be instituted, which, in turn, may increase the number of idle?

5. If Britain reduces wages, what will be the effect upon international trade in price levels, and in turn, upon American wages?

6. Are American standards of living to remain unchanged, even if the permanence of high wages and lowering living costs means a continuance of bread lines and public relief?

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Highway Bridge Design

A pamphlet of 48 pages sent out by the American Institute of Steel Construction, 200 Madison Avenue, New York, consists in part of a paper by T. W. Dodd, president, St. Joseph Structural Steel Co., and a discussion by J. E. Greiner, consulting engineer. The paper is well illustrated with both line cuts and half tones, mainly the former, and goes into a good many of the details of construction, including the panels of trusses and the matter of approach members.

Some of the requirements of the different States are brought out by comparison of one form of construction with another. Much of the material goes into costs and the effect upon costs of these special requirements.

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A pamphlet prepared by the United States Bureau of Mines, dealing with iron ore, pig iron and steel in 1929, is a portion of the book, Mineral Resources of the United States. The pamphlet gives in 42 pages a survey of the 1929 production and shipments of iron ore, together with the foreign trade in that commodity, and similar information regarding pig iron, ferroalloys and steel ingots and castings. The export and import figures for steel deal with finished manufactures as well.

Dollar values are given of most of the commodities in the pamphlet, which consists largely of tabular presentation of the facts.

REGULATIONS FOR STRUCTURAL WELDING IN GERMANY

By DIPL.-ING. OTTO BONDY

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STRUCTURAL welding is a development of the past five years. While it is true that welded steel structures were erected in Germany some years previously to test their load capacity, the first application of arc welding to the construction of shops and other buildings was in America in 1926. Welding has now been introduced in nearly all industrial countries where steel is produced and consumed. Progress in this field has depended on the enthusiasm and devotion of a small number of specialists.

Construction of welded steel buildings in Germany has come to the fore rapidly since early in 1929. A number of shop buildings, trestles and welded structural members[1] have been fabricated by welding. The German State Railroad has fallen in line with this modern trend by erecting a welded bridge 10 meters (33 ft.) in length on one of its main lines.

Some months ago a steel roof truss of a shop with a length of 20 meters (66 ft.) was welded at Siemensstadt, near Berlin. The girders, entirely welded from plates, have a span of 10 meters. For the German State Railroad in Stettin the roofs of a platform, with one column, have been completely welded. At Riesa (in the center of Germany) large dust-coal bunkers with trestle-work were erected by arc welding. The structure has a weight of 95 tons; a saving in weight of about 20 per cent was effected through the use of welding.

A wide-span framework for a roof truss was welded at Niederschöneweide, near Berlin, to cover a shop of the German State Railroad. At Dortmund girders erected for a welded shop have a web depth of 3 meters (9 ft. 10 in.) For a new structure at the Deutsches Museum in Munich cantilevers of I-form were welded together, because there was no room for riveting or screwing. This list could be greatly extended.

The rapidly growing vogue of welded steel structures in Germany created a demand for legal regulations for their design and calculation. At the beginning of 1930 a draft of rules for erecting welded steel structures was published[2]. It was prepared by Prof. Dr.-Ing. Hilpert of the Technical University of Berlin in conjunction with Mr. Cajar and the writer. The Fachausschuss für Schweisstechnik (Special Committee for Welding Technique) of the Verein Deutscher Ingenieure paved the way for collaboration of the specialists with the government authorities and the structural steel industry.

Shortly afterward regulations were promulgated by the Prussian Ministry of Public Safety. These were based partly upon the original draft of rules, but in many respects are more extensive. Particularly noteworthy is the paragraph on the calculation and the

[1] One hundred pictures and drawings of welded steel structures are assembled in: Bondy "Ausgewählte Schweisskonstruktionen, Stahlbau," Vd I-Verlag, Berlin, 1930.

[2] "Die Elektroschweissung," Berlin, January, 1930.

permissible stresses. The table gives permissible unit stresses for both Germany and the United States.

Permissible Unit Stresses in Pounds per Square Inch

		Tension	Compression	Bending	Shear
Germany	Base Stresses	10,300	12,800	as for tension	8,600
	Stresses Increased by ⅓	13,800	17,200	and compression	11,500
United States		13,000	15,000		11,300

The comparison in the table shows that the base stresses stipulated by the German regulations are much lower than those of the American regulations. But it may be said that the German regulations refer to open-hearth steel (St. 37), the rupture-load of which is about 37 to 45 kg. to the sq. mm. (53,000 to 64,200 lb. per sq. in.). It may also be mentioned that the German regulations provide an increase over these base stresses by one-sixth to one-third, provided certain conditions regarding the design and execution are fulfilled. The stresses increased in this manner are approximately the same as those in America, exceeding them by a trifle.

The technical and economical advantages of welding are steadily becoming better appreciated by the German structural steel industry. The experience of the next few years will decide to what extent the application of welding in the construction of buildings and bridges will replace riveting.

Regulations prescribed by the Prussian Minister of Public Safety, Berlin, constitute the remainder of this article.

Rules for Erection of Welded Steel Buildings in Germany

FOR welded steel buildings generally the regulations regarding the loads accepted for buildings, dated Dec. 24, 1919, are in force (so far as they are still valid), as well as the regulations regarding the permissible stresses and the calculation of structures made of open-hearth steel, etc., dated Feb. 25, 1925, so far as not conflicting with the following provisions.

Erection of welded steel buildings assumes, to a special degree, thorough knowledge and practical experience in this method of building. Therefore only trustworthy contractors should be entrusted with the erection. The prescribed inspection and supervision

DEVELOPMENT of welded structures in Germany has taken several forms, including both buildings and bridges. Some of the built-up members of the latter are of unusual design, and even a short-span railroad bridge has been so constructed. This article shows the progress which the work has made and includes the Prussian regulations governing the erection of welded structures.

of the construction must be by an engineer experienced in welding, and he must have assistants skilled in this work.

All materials which fulfill the above specifications are admitted, so far as their qualification for welding is evident, in addition to those materials which are certified for this method of building by reason of tests.

Welding wires are to be chosen according to the different locations (horizontal, vertical, overhead) in such a manner that they might be welded satisfactorily.

Methods may include arc welding (d.c. or a.c.), resistance welding or gas welding. The choice of the welding method and of the equipment is left in the hands of the contractor, but must be made in such manner that unfavorable accessories during the welding are avoided.

Erection Requirements

The location of welded seams to be made in the field must be marked in the shop. Also the order in which the seams are welded during erection must be generally fixed beforehand, by the responsible supervisor of the erecting firm or by his representative, in such manner that no dangerous stresses remain. Reg-

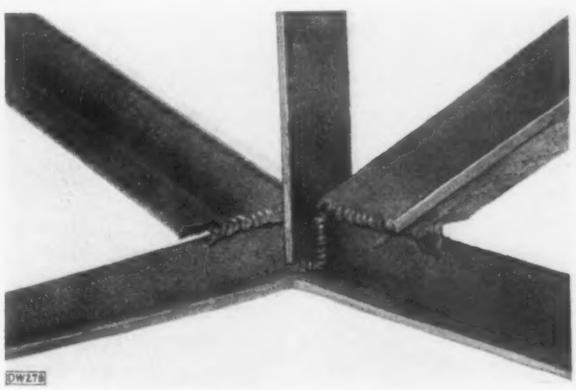


Fig. 1—Welded joint in a roof truss of 11.9 m. (39 ft.) span.

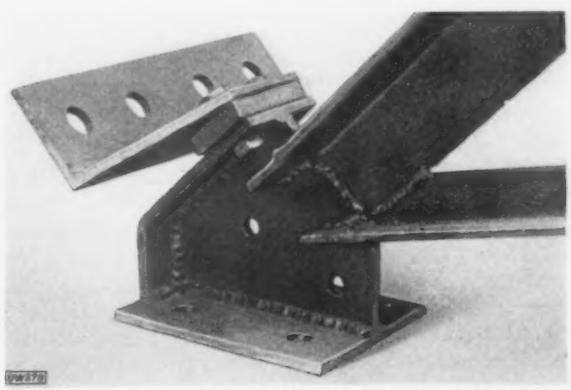


Fig. 2—End joint in the same roof truss represented in Fig. 1.

ulations for welding in the field stipulate the following:

Tack welds for assembling are to be made without forcing together the individual parts. Clamps or screw-vises may be used only to avoid movement of the parts during the welding. Surfaces to be welded must be free from rust, dirt, etc.

When welding has to be done in the field, which is to be limited so far as possible, suitable accommodations must be provided, such as protection of the welder from the weather, etc., to guarantee satisfactory welding.

For the static calculation, the design and the execution the same principles are valid as for riveted structures, unless the special character of the method of building demands new ideas in construction. At the joints, for example, there are to be placed, if necessary, beads, etc., as a protection from water; these beads cannot be considered in connection with transmission of stress.

In the specifications and drawings the selected method of welding and the kind of welding wires are to be stipulated. The welded joints must be arranged so that they are easy to inspect and to survey. In the drawings the welded seams are to be marked in the same way as stated in the static calculation.

Welded joints which are exposed to tension or compression are to be calculated by the relation:

$$P = F \times p$$

whereby $F = a \times l$

In this formula

P = the load in kg. to be transmitted by the welded seam,

F = the section of rupture of the welded seam in sq. cm.,

a = the throat of the welded seam (cm): for fillet welds, the height of the isosceles triangle marked within the cross-section of the fillet weld, not one of the two longer sides (Fig. 12); for butt welds, the thickness of the cross-sections to be connected; when they differ, the thinner prevails (Fig. 13),

l = length of the welded seam, exclusive of the length of the two craters at the ends, with the length of 2 a for each.

Those parts of the structure which are exposed to bending moments can be assembled by interrupted seams sufficient to take care of shear stresses due to bending.

By using structural steel "St. 37" the permissible unit stresses (p), are as given on the next page.

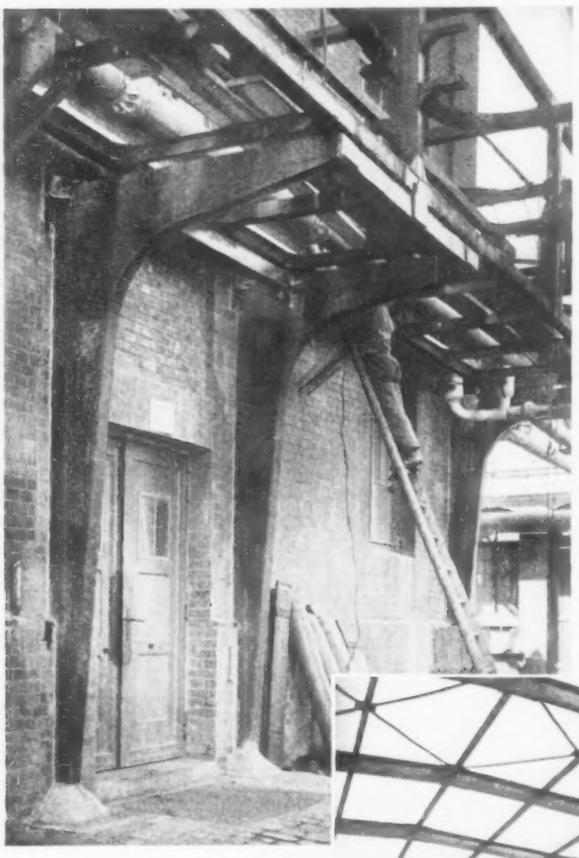
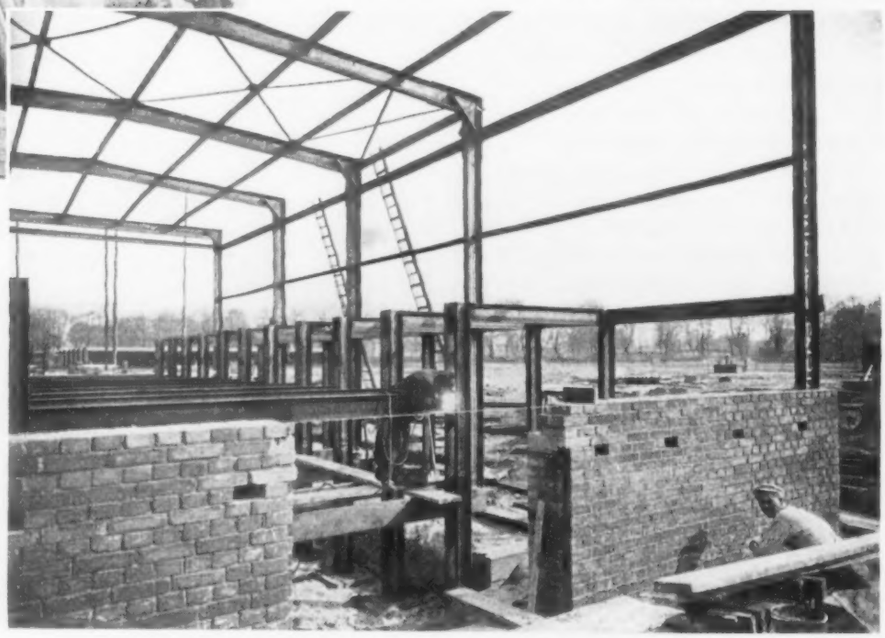


Fig. 3—(Below) welded steel structure in the Siemens-Schuckert Works in Berlin. This building, erected in 1930, measures 10 x 20 m. (33 x 66 ft.), and is 6.3 m. high (20 ft. 8 in.).

Fig. 4—(At left) welded supports for a pipe line bridge in a gas works near Leipzig.



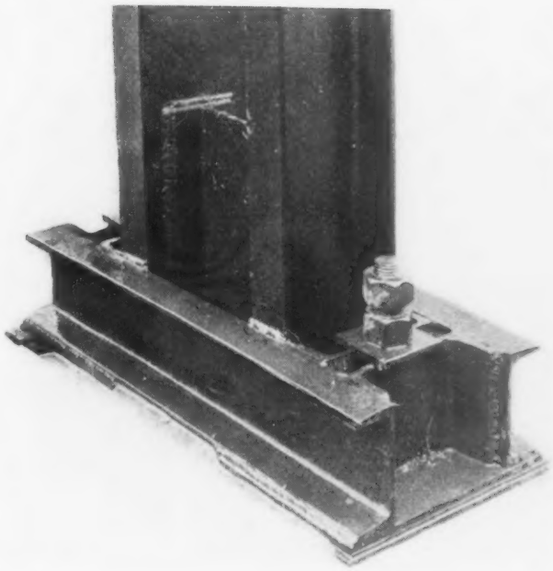


Fig. 6—(At left) foot of a column of a crane runway. The two channels of the column are stiffened by welded sections of I-beams between them. All parts are welded except the anchor bolts.

Fig. 7—Inside of a built-up girder of an arc-welded railroad bridge 8.86 m. long (29 ft. 1 in.).

Tension, 720 kg. to the sq. cm. (about 10,300 lb. per sq. in.)

Compression, 900 kg. to the sq. cm. (about 12,800 lb. per sq. in.)

Bending, as for tension and compression

Shear, 600 kg. to the sq. cm. (about 8600 lb. per sq. in.)

Under combined loading by longitudinal stresses and shearing, the total unit stresses must not exceed the maximum stresses given. For those parts of the structure which are exposed to alternating or dynamic stresses, for cranes of all kinds as well as for all seams welded overhead, the stated permissible stresses are to be reduced by one-sixth.

Generally, the specified stresses may be raised under the same conditions as they are fixed by the aforesaid official regulations regarding the permissible stresses, etc., of steel structures, dated Feb. 25, 1925.

Inspection and Contractor's Test

EXAMINATION of the welders shall prove their ability. It shall be made with the same welding wire and, so far as possible, with the same kind of machinery or tools which the contractor uses in the shop and in the field. The following examination is necessary:

Fillet welds are to be made on two longitudinal sheets exactly vertical, one above the other, upon a horizontal piece (Fig. 14), making a cross in transverse section. The welded seams are to be laid under a right angle to the direction of the lamination. The height of the welded cross is 300 mm. (11.8 in.) plus thickness s of the sheet.

The thickness a of the seam prescribed to the

Fig. 5—Welded frame at right and welded bridge construction at left, designed for use in a railroad station near Berlin.

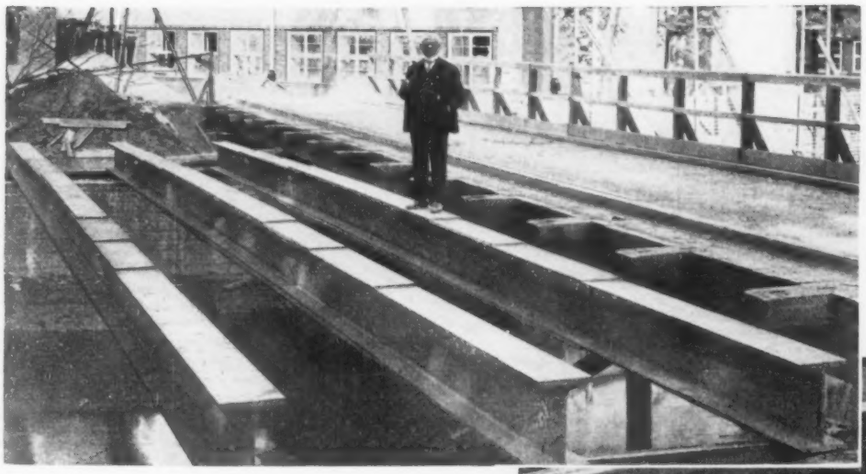


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Fig. 8—(At left) highway bridge at Leipzig. The girders are made of I-beams reinforced on each flange by three superposed plates attached by arc welding.

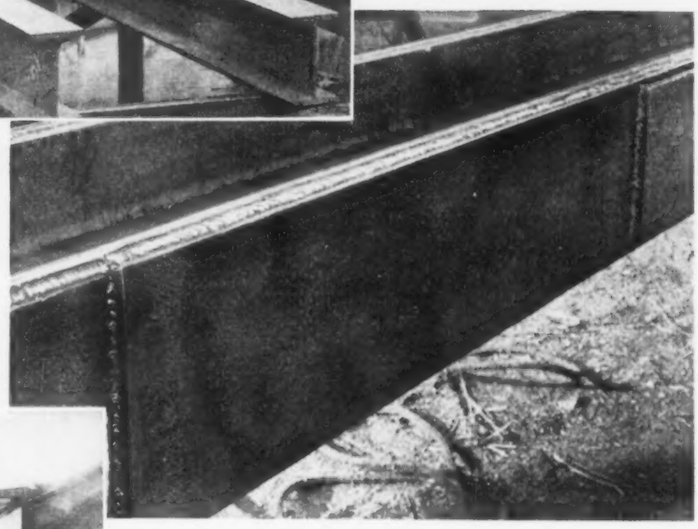


Fig. 9—(At right) detail of one of the girders of the bridge in Fig. 8. This shows the way the reinforcing plates were welded to the I-beam.

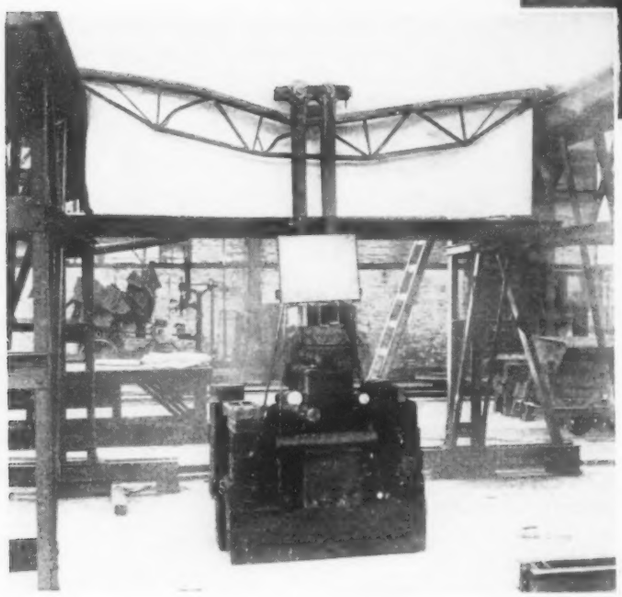


Fig. 10—(At left) model of an arc-welded crane structure tested to destruction. This shows the buckling of the members through imposition of a load of more than 5 metric tons.

Fig. 11—Harbor crane of 6 tons capacity, all parts of which were welded; this includes the rolling framework and the crane arm with its counterweight.

FIG. 12

FIG. 13

welder has to be 0.6 times the thickness *s* of the sheet. The two longitudinal sheets which are to be welded upon the horizontal sheet are to be about 20 mm. (0.8 in.) shorter than the cross sheet, so that tack welds can be placed at the heads. The beginning and the end of the welded seam will not be considered when cutting out strips for test. Two of the four fillet welds (1 and 2) are to be welded in a horizontal direction, the sheets being in vertical and horizontal position; the other two (3 and 4) in a vertical direction.

Out of the welded sheet three strips each about 35 mm. (1.4 in.) wide are to be cut by cold saw and pulled in a machine in direction of line *W-W*. In this case the rupture load applied to the unit of the cross-section *F* must produce at least 30 kg. to the sq. mm. (43,000 lb. per sq. in.). Otherwise the welder is to be rejected.

When any welding overhead is to occur, it may be required that two seams of the test piece be welded overhead.

Test of the Welding

In using the same kind of welding and the same welding wires as for the erection of the structure the following tests are required: Test of a transversal fillet weld according to Fig. 12; test of a longitudinal fillet weld.

Four strips corresponding to the thickness of the parts in the construction are welded together in horizontal or vertical direction to a test piece by longitudinal fillet welds (Fig. 15). The length of the seams has to correspond nearly with the width of the straps. In this case the cross-section where the rupture occurs has to produce a rupture load by shearing of at

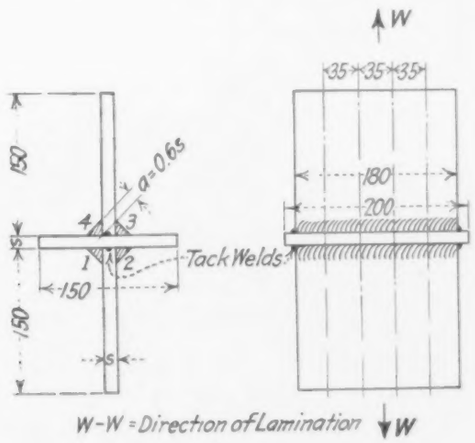


FIG. 14

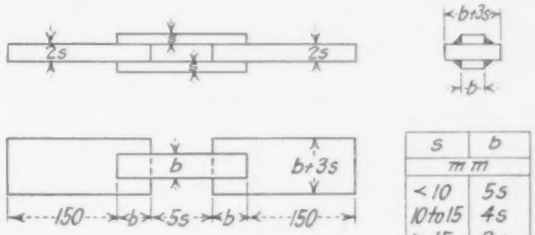
least 24 kg. to the sq. mm. (34,400 lb. per sq. in.).

Two sheets, each 6 or 12 mm. (¼ or ½ in.) thick, corresponding to the thickness of the parts being joined, are welded together to a test piece by V- or X-seams (Fig. 16). The beveled borders of the seam shall form an angle of at least 60 deg.

The test pieces may be subject to a test for tension or bending. In tension the rupture load must attain at least 30 kg. to the sq. mm. (43,000 lb. per sq. in.).

In special cases a test for bending may take place. For plates up to a thickness of 20 mm. (0.8 in.) a rod of twice the thickness of the plate with a circumferential radius of the thickness of the plate is to be put exactly on the middle of the seam; at V-seams this has to be done at the root-side of the seam; the welding seam at the root is to be flattened beforehand.

The clear distance between bearings is 5 *s* (Fig. 17). The experiments shall be generally limited to



s	b
mm	mm
< 10	5s
10 to 15	4s
> 15	3s

FIG. 15

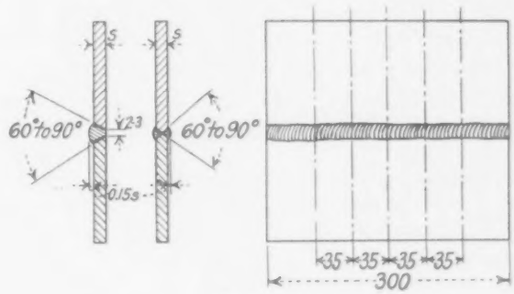


FIG. 16

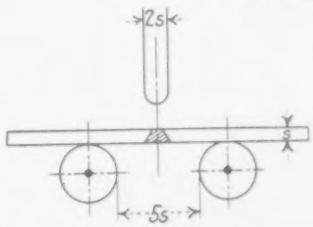


FIG. 17

plates of 6 and 12 mm. (¼ and ½ in) thickness. The test piece is to withstand bending through at least 60 deg. before the first rupture occurs.

For the test which has to take place chiefly in the shop under the supervision of the local building police, all welds must be easy of access. Welded parts, so far as they are not yet tested, are to be covered, before leaving the shop, with a transparent paint only. Welds executed in the field are also to be tested carefully. If in special cases loading tests are necessary, the official entrusted with the test has to decide.

PROBLEMS CONFRONTING THE PRACTICAL NITRIDER

By J. H. HIGGINS

NITRIDING of steel has made such rapid progress, since it was introduced three years ago, that many practical problems have arisen which perplex the user. At a meeting recently of the Philadelphia chapter of the American Society for Steel Treating, several of these problems were discussed by the author, who is materials engineer, Camden Forge Co., Camden, N. J. This company has one of the largest nitriding furnaces in the country, in which it treats large forgings. Of no less interest than the speaker's address were his subsequent answers to questions pertaining to specific phases of nitriding practice.

NITRIDING of steel has reached such proportions that it is physically impossible to cover its many principles in a short article. It will be well to confine our discussion to existing practical conditions confronting the commercial nitrider, rather than to review the extremely technical principles of this process.

What will be said must deal mainly with the methods used to avoid disappointments in the use of this steel. It is a good steel and, when handled intelligently and with care, properties of great mechanical advantage are secured. I shall dwell at some length on certain conditions which appear to cause the most trouble at the present time. Some of my remarks will be contrary to statements made by other investigators, but they are based on laboratory tests and nitriding experience, and can be accepted as an honest opinion of one engaged in the business of practical nitriding.

Selecting, Forging and Machining the Steel

Selection of steel is important. Nitriding steels have a tendency to retain dirt and other inclusions. This is especially true of steel in the larger sizes and, when such inclusions are present, they weaken the core strength and promote non-uniformity of the case hardness.

The steel forges best between 2150 and 2250 deg. F. It flows freely and is unusually free from cracks or tears. Its machinability depends entirely upon the hardness of the core. Generally speaking, it cuts clean and free. Some trouble was experienced when used in automatic machines, but this has been helped materially by the introduction of a steel containing high sulphur.

Quenched and tempered parts with a sorbitic structure are considered superior to annealed material with large grain boundaries. It is rightfully claimed that nitrides penetrate between the boundaries of an open structure and the result is a brittle and non-uniform case hardness.

Normalizing is very important. Internal strains are always present in steel, whether they be produced by forging, tempering or machining, and unless they are removed by normalizing before finish machining, the steel will undoubtedly warp during the nitriding period. It is true that distorted parts can be straightened, but whether they remain straight when in service is a question. Better, by far, to remove the cause than suffer the result.

The Nitriding Operation

Proper equipment is necessary to nitride successfully. This is especially true of the box, or container. Two years ago, it was thought necessary to use only alloy containers. The company which I represent felt this was not compulsory and, accordingly, placed in service a low-carbon, structural steel container. This container was followed by others of a like composition; all of which gave service ranging from 700 to 1600 nitriding hours before rejection. The growth of the nitrides were carefully followed on microscopic specimens removed from the container after each charge. At present, enameled containers are under investigation, and results obtained to date give excellent promise of success. There are three important factors necessary to a good container:

First: It must be absolutely air tight.

Second: A fan of sufficient size to properly circulate the heat and gases.

Third: Sufficient thermocouples to determine the temperature at all parts of the container.

Some authorities claim a fan is not necessary to good nitriding. Our experiments have proved it to

be absolutely necessary, not only as an aid to the distribution of the gases, but the temperature as well. Any type of furnace will be satisfactory provided it can be held under control at the low nitriding temperature.

There are several other factors that have a direct bearing, not only on successful nitriding, but on the successful service of nitrided steels.

Decarburization and Its Bad Effect

The harm caused by decarburization is not generally known, or, at least, not appreciated. There is no single condition facing the commercial nitrider that causes more grief than a decarburized surface on nitriding steels. This is so general that a full charge is seldom completed without finding one or more forgings that have spalled. In every case spalling was found to be due entirely to decarburization.

Repeated tests have been made in our laboratory to determine what amount of decarburization was necessary to cause spalling or flaking of the case; specimens were prepared with decarburized surfaces ranging from 1/16 in. down to just a visible trace. There were seven of these specimens, all nitrided, and within a few days every specimen spalled or flaked on some part and to an extent proportionate to the degree of decarburization. Nitriding steels, for some reason, form a deeper decarburized or, commonly termed, "bark" surface than carbon or alloy steels treated at the same temperature.

The consumer should bear this in mind and not be governed by the amount of metal he is accustomed to remove on any of the S.A.E. steels. The depth of decarburization varies, but is usually gaged by conditions under which it was handled.

Ductility of Case

I have frequently been asked how to determine the ductility of the case, and always had to reply that it was very difficult to determine. It was thought that, when a case was tested by the Vickers machine and the indentation spalled, brittleness existed. This is not reliable, for a slight tool mark on the surface will cause spalling or cracking of the case at the point of testing. The better method is to prepare a piece about ½ in. in diameter by 8 in. long, bend this in the usual way and note carefully when the case cracks. By this method the load necessary to crack the case can be noted, as well as the extent of distortion.

Ductility, to some extent, can be imparted to the case by the double cycle method of heating; that is, heat to 950 deg. F. for a given number of hours, then elevate the temperature to 1150 deg. F. and hold for about 2 hr. This will serve to toughen the case, but will reduce the hardness approximately 100 points.

There are some who prefer using the higher tem-

PERTINENT QUESTIONS ANSWERED BY THE AUTHOR

Question.—At what temperature does nitriding start?

Answer.—It is generally understood that ammonia gas breaks up at about 880 deg. F.; nitriding starts at that temperature or close to it.

Q.—Does nitriding have any effect on core strength?

A.—Core strength is obtained by a heat treatment of the steel prior to nitriding. When the nitriding temperature is not higher than the initial draw-back temperature, there is no appreciable change in core characteristics. If, for any reason, it is considered advisable to nitride at temperatures above the draw-back temperature, then there will be a reduction in core strength.

Q.—You made the remark that all sharp corners and edges should be removed before nitriding. May I ask why?

A.—When nitriding material with sharp edges, the nitrides penetrate both sides as well as the edge, forming a hard, solid mass, which, in some respects, is brittle. The lack of a supporting core at the edge permits spalling when struck even a light blow. A very small radius on all edges would eliminate this danger entirely.

Q.—Will steel containing 0.50 per cent aluminum nitride as well as that containing 1.50 per cent, and what should the range be?

A.—Aluminum has a high affinity for nitrogen. It is only reasonable to assume that the higher percentage would be more satisfactory. The range, in my opinion, should be 1 to 1.50 per cent.

Q.—Do you think satisfactory nitriding can be accomplished with any fuel, or would an electric or gas-fired furnace be better than an oil-fired furnace?

A.—Personally, I don't think it would be of any importance what fuel was used, providing the furnace was properly constructed to distribute the temperature uniformly throughout the nitriding box.

Q.—Is it possible to obtain decarburization on materials while nitriding, or is this found only where insufficient material had been removed previous to nitriding?

A.—An excess of hydrogen will produce decarburization. This is caused by high dissociation. While this is possible, it is hardly probable, as all furnaces are equipped with dissociating equipment, which permits the operator absolute control of dissociation.

Q.—Is there any possibility of the case separating from the core?

A.—The case gradually merges with the core and the possibility of one separating from the other is negligible.

Q.—Does molybdenum play a very important part in nitriding steel, and why?

A.—Yes, molybdenum is an important constituent. It imparts ductility to case and core.

Q.—In various articles published on nitriding, opinions seem to differ as to which temperature produces the most satisfactory results. What is your opinion?

A.—If extreme hardness is required, the temperature of 950 deg. is usually employed. If ductility, combined with hardness, is desired, then temperatures up to 1150 deg. can be used. It must be remembered, however, that, while ductility of case is obtained, the hardness decreases to a marked extent.

perature first, followed by the lower temperature, but this, in my opinion, does not produce the best combination of ductility and hardness.

Corrosion and Welding

The complete extent of the resistance to corrosion of nitrided steel is not known at this time, for this is a test that requires, in many respects, years to complete. Laboratory and, in some cases, service results have shown it to hold much promise. It is known to resist corrosion in hot and cold oils, gasoline, tap and salt water, both hot and cold; and ordinary atmospheric conditions.

When more is known of this test, the field of nitrided steels should broaden considerably.

The welding of this steel, when nitrided, presents another field requiring much study and experimentation. Spot welding can be accomplished successfully without much effort; carbon steel flanges have been welded to nitrided bars; butt welds have been made, but not with any great success.

In welding the steel in its natural state, a loss of perhaps 50 per cent of the original aluminum content will take place. This seriously interferes in the nitriding of a uniform case. Many users of this steel are experimenting with this problem, and someone will, no doubt, discover a method of welding this steel satisfactorily in the near future.

Growth of Case and Effect of Heat

A certain amount of growth due to nitriding occurs on all forgings and it is utterly impossible for a commercial nitrider to estimate this growth accurately before nitriding. Most of this uncertainty is brought about by the difference in preparation occurring in different shops. On solid rounds from 3 to 12 in. in diameter, the growth appears to be progressive and ranges from 0.00025 in. to 0.002 in., depending not only on preparation, but also upon the wall thickness and diameter. If the first of these three factors is controlled, the effect of the other two can be determined and should be constant for the same size.

The effect of heat on the nitrided case plays a very important part on forgings in service. A little more than a year ago, several well known authorities made the statement that the case would hold its initial hardness when heated up to 1800 deg. F. Today we know differently, for the case begins to lose its hardness when subjected to heat slightly above the nitriding temperature, and the loss increases as the temperature rises. Repeated tests have been made on pieces buried in fine turnings, then heated in an electric furnace at temperatures from 1100 to 1800 deg. F., with the following results:

Sample	Original Case Hardness	Annealing Temperature, Deg. Fahr.	Case Hardness After Annealing
1	1003	1100	895
2	974	1200	782
3	1003	1300	627
4	946	1400	514
5	1033	1500	473
6	946	1600	446
7	1064	1700	327
8	974	1800	246

Nitrided 40 hr.
Annealed 1 hr.—samples buried in fine steel turnings.
Vickers testing machine.

Re-Nitriding

In order to determine if any of these pieces would re-nitride, they were all placed in the ammonia gas for a period of 40 hr. at temperature and then again tested. It was found that the case hardness increased only a fraction, except specimen No. 8, which jumped from 246 to 380 Vickers' Brinell.

In my opinion, when the case hardness is destroyed by heat, it cannot be re-nitrided to its initial hardness, unless the original case is machined off.

Conclusions

The use of nitriding steels has increased tremendously in the past year; this growth is represented not only in the smaller forgings, but the larger ones as well. Forgings weighing 100 lb. were considered large one year ago; today, the weights run to 1000 lb. and over.

The possible uses of the nitrided steels are limited only by the boldness of the designer and the vividness of his imagination. Whether or not its application to a particular service is practicable can be determined only after a thorough engineering discussion. Even this discussion may not clear all minds of doubt; in which event, an actual trial or trials in service are well worth making, for, if the steel is a success, it is a big success and any timidness or hesitancy or any condemnation of the process, on account of its newness, is not warranted, in view of the possible or probable gains.

It does not follow that every machinery part that wears out should be replaced by a nitrided steel, for there are limitations to its use, but just where the limit is has yet to be determined.

Bright Annealing of Steels in Hydrogen

At the February convention of the American Institute of Mining and Metallurgical Engineers, Floyd C. Kelley, General Electric Co., presented a paper on "Bright Annealing of Steels in Hydrogen," dealing with causes of oxidation of stainless iron and low-carbon steel in hydrogen furnaces and methods of preventing it.

The fundamental knowledge obtained from a series of experiments which are described is applied to the continuous annealing of these materials. The chief causes of oxidation are water vapor held by the furnace insulation, moisture condensed in the cooling chamber, and air which diffuses into the furnace against the pressure of the hydrogen.

Low-carbon steel has a critical temperature range of oxidation, which does not favor slow cooling from the annealing temperature if bright material is desired. Stainless iron undergoes selective oxidation in a furnace of the same type, and this oxide is not easily reduced. The author concluded by describing two different furnace designs for the continuous annealing of these materials. One is used for low-carbon steel, and the other for stainless iron (rustless steel). The furnace designs are based on the data obtained from the experiments described in the paper.

Photograph by John P. Mudd for the Midvale Co.

GIVING Industry a Lift. Spectacular handling this, in which giant electric power is serving molten metal. What embryo mechanisim, as yet shapeless, is seething in this ladle, to emerge and crystallize into its predestined form?

HANDLING ASSEMBLY AND TESTS FROM

By C. W. PRESTON
Majestic Household Utilities Corpn., Chicago

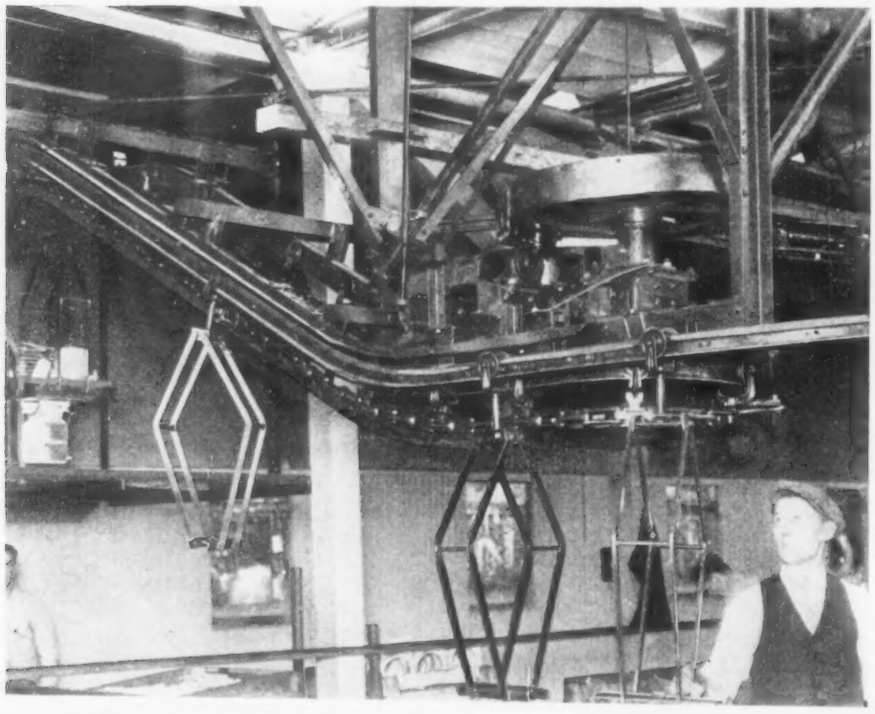
STUDIES of all forms of conveyors had to be made when it was decided to make electric refrigerators in the plant of the Majestic Household Utilities Corpn. Transportation under these circumstances, involving both assembly processes and testing, can easily comprise a large share of the shop cost. It was early determined that no one system of transportation could be used throughout the plant.

We had used monorail to some extent in various parts of the radio plant and found it to be a great labor saver. This was especially true in the plating department, shown in one illustration, where electric hoists are used in connection with it for handling heavy racks into and out of tanks. Handling is so easy that one man can move the load directly from one tank to the other. Several hoists are used on this system, thus making it much more flexible than a crane. By means of a switch, the loads are finally taken to the department where they are to be used, without having to be trucked.

The profitable experience with the use of this method caused it to be given consideration in the general layout. The study of all material handling methods revealed the following facts favorable to monorail, especially for handling the refrigerating unit:

First: Little Maintenance Required.
The only wearing part is the wheel bearing, which, being ball-bearing type, can easily be replaced.

Second: Flexibility.
Short-radius curves can be made; switches enable us to reach any desired point in the plant. It can be run up and down hill and interlocked with transfer cranes, as shown in one illustration. Units can be handled very rapidly in large lots, or allowed to stand on storage tracks for



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Booster to elevate empty trolleys from low-level to high-level track. They then return by gravity to the starting point.

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AN OVERHEAD MONORAIL SYSTEM

FOUR primary factors have been found to be inherent in the overhead monorail system adopted in a Chicago plant. Little maintenance has been required. The system has both physical and functional flexibility. A variety of methods of propulsion can be utilized, prominent among which has been gravity. The cost of installation was found lower for the area covered than other systems appeared to offer.

How this system has been put to work and the details of how it operates in handling materials through the plant are described in this paper, which was prepared for presentation at the National Industrial Congress, Cleveland, on April 14, through the auspices of the American Society of Mechanical Engineers.

unlimited time. As they are handled on the ceiling and travel above aisles and machines, extra storage space is furnished in an already congested department without absorbing additional floor space. None of this could have been done with a continuous chain-drive conveyor.

Third: Methods of Propulsion.

Carriers can be electrically driven, raised or lowered by drop sections or chain boosters, and be propelled on level track by hand, or travel on a sloping track by gravity. All of these methods are used in the plant.

Fourth: Cost of Installation.

Greater area can be covered by monorail and transfer cranes than by any other system we could find at the same installation cost.

At this writing there had been no definite plan of transportation worked out for the Kolmar Avenue plant, where a partial assembly of the unit takes place. However, temporary lines were installed so that the assembly methods might be studied, and the best system worked out for this particular unit.

At the end of each of these lines is a short section

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Overhead units in the plating department, where electric hoists are used for handling heavy racks into and out of the tanks.

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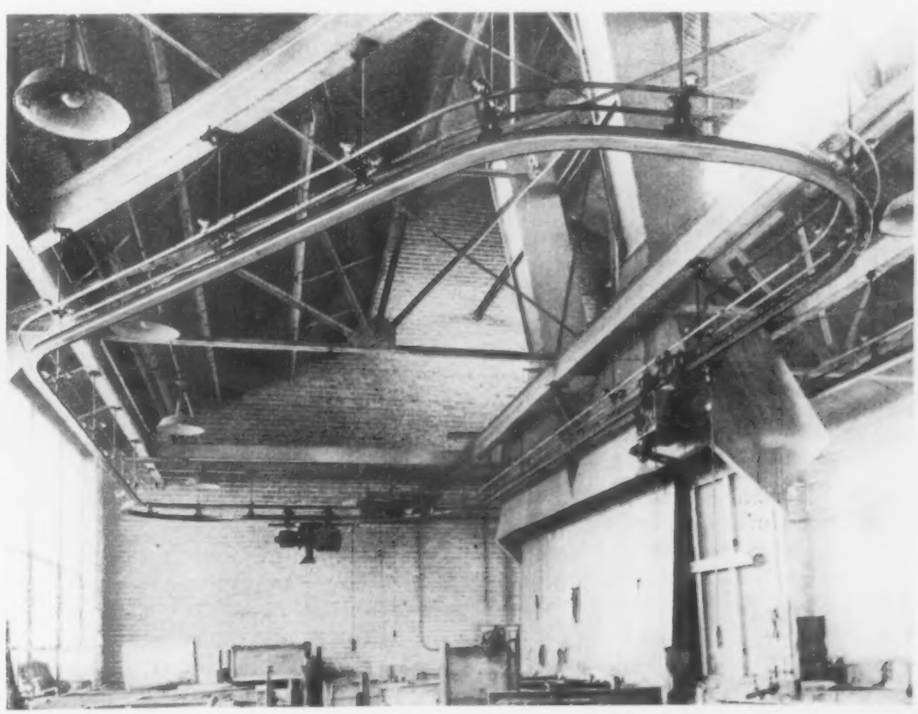
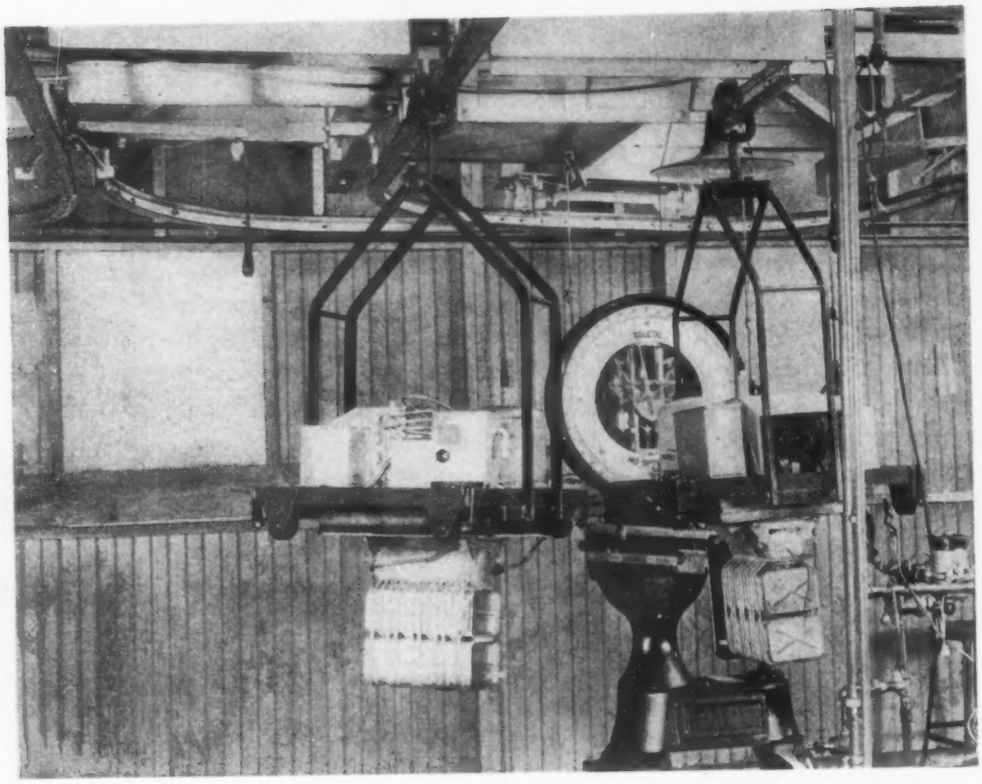




Handling a refrigerating unit on special dolly and trolley grab. This shows overhead the special switches in the charging room. The workmen can pull the unit off the main line at any switch serving the filling and testing stations.

of monorail upon which an air hoist runs between the lines and a tank of water. As the unit is assembled, it is picked up from the line, conveyed to the tank of water, and given a leak test at high pressure. It is then lifted from the tank, has the water blown off, and is placed on a specially designed truck. This truck, with several others, is taken to the loading platform where the units are loaded on to a motor trailer for the Dickens Avenue plant, approximately two miles away.

In the near future, trucking from the assembly lines to the loading platform is to be replaced by monorail.

Special Dollies and Grabs Developed

AT the receiving platform of the Dickens Avenue plant the units are set in an angle-iron frame provided with four casters. This frame, together with the trolley and special grab holding the unit, is shown clearly in one picture. It acts as a dolly and runs on double-angle track, which constitutes both the assembly benches throughout the plant, and tracks for the dehydrating oven chambers. This dolly remains attached to the unit throughout the operation, until it is ready to be assembled into the cabinet.

At the loading platform the dollies are placed on a short length of double-angle track and the units set in them. Over this point is a monorail equipped with two-wheel ball-bearing carriers and a special grab. This grab catches the dolly and unit in such a way that when run off the angle track the unit, together with the dolly, is suspended from monorail. The trolleys are then pushed by hand from the receiving platform into the building, where a conveyor chain booster, having pusher fingers, engages with the trolley and propels it slowly down an inclined track through the test tank filled with water. Here a test is made, using air pressure, to find any small leaks that may have been caused by rough handling while being trucked from one plant to the other.

Flexibility Served

A chain booster used in connection with monorail has a decided advantage over ordinary chain conveyors in this application. Intermittent handling required sufficient flexibility to enable us to put through units in lots of 20 or 30 at many points on the system, and then to let them accumulate on storage tracks for varying periods.

This type pusher is used also to elevate both loaded and empty carriers a sufficient distance to allow them to travel by gravity for several hundred feet. This method not only furnishes economical handling, but it allows us to use a portion of the ceiling for the storage of units, thus furnishing a reservoir between various points in the assembly process. It is readily seen that this could not be done with the conventional chain-drive conveyor.

Air-Operated Drop Sections Utilized

AFTER passing through this first test tank, the units are lowered by means of an air-operated drop section in the monorail to the double-angle track which serves as an assembly bench. The empty carrier, which is equipped with a special grab, is raised again to the higher monorail level, and travels by gravity 80 ft. to the other end of the assembly bench,

while the unit travels on the dolly along the assembly bench. This is illustrated, also.

As assembly at this point is completed, the units are put back on the monorail by means of another series of drop sections. They are then moved on by hand to another test tank, where they are lowered over an inclined track by means of another booster, drawn through the test tank and raised to an elevation sufficient to allow them to travel by gravity at a high level over aisles and machines to another booster. This lowers them to a level of about 4½ ft., where they are stored on a series of storage tracks in front of a large special dehydrating oven.

These storage tracks are interconnected with a charging elevator that moves on a double track to any position in front of the four dehydrating ovens. The elevator is arranged with two sections of track, one of which is stationary and at a convenient height for easily transferring trucks on to it from the monorail storage tracks. The other section is in line with it, but movable up and down so that, while three units are being loaded on to the stationary section, a similar number of units are being transferred from the elevating section on to the oven conveyor.

Four Levels of Conveyors

In each of the four ovens are eight independent drag-chain conveyors, consisting of a double track on which the dollies carrying the units are moved through the oven by means of a conveyor chain with lugs that engage with them. The conveyor systems are arranged on four levels, there being two parallel systems on each level. An electric motor on top of the oven furnishes power through a variable-speed transmission and a gear reduction unit. Each conveyor is connected independently through a clutch system.

Through a remote control switch, the electric motor for the drive chain can be started or stopped from any loading level and, by movement of the clutch, the conveyor may be put in operation and the units on the dollies moved to the proper position in the ovens.

This operation removes every particle of moisture from the unit and prepares it for the reception of oil and sulphur dioxide gas.

Upon removing the unit and dolly from the monorail carriers, the empty carrier is run by hand up to the return side of the last booster, which elevates it sufficiently to return it by gravity to the receiving platform.

Great Flexibility a Prerequisite

IN the charging room, by the use of short sections of monorail and glide-type switches, a unique system was worked out by means of which a large number of units could be charged in a small space. Because of the short bends necessary, only monorail could be used. If we had tried to use benches and trucks, at least four times as much floor space would have been necessary to accomplish the same amount of work.

The glide-type switches mentioned in the preceding paragraph (seen in one photograph) are used at each one of the 21 stations in this room. By means of them any one of the workmen can pull a unit from the main line without interrupting the flow. Since it is necessary to determine accurately the amount of gas and oil added to the unit, several delicate dial

Electrically-driven transfer crane interlocking with monorail running into the building. This particular unit unloads and stores 2800-lb. cylinders of sulphur dioxide.

track scales are employed. These are shown in one picture, with a unit hanging from the scale immediately in front of the scale dial head.

After being filled and inspected, the units are pushed to another monorail booster and raised to a height just under the building truss chords. From here they travel by gravity to the line in front of the ten assembly benches, where the electrical apparatus is installed.

Loaded trolleys are switched from the main line directly over the assembly benches, at each of which there is an air-operated drop section, a duplicate of those already shown. These drop sections again lower the dolly and unit to the angle-iron track assembly bench, then raise the empty carrier and grab to a high level, from where they travel by gravity 80 ft. to the other end of the assembly lines. Here, by means of another drop section, the carrier is lowered to pick up a unit, after the final assembly is completed, and carries it to the inspectors.

All Operations on Monorails Through Testing Work

FROM this point on, all operations of the unit are performed while suspended from monorail. The carriers travel with ease, a girl handling as many as 20 of these units at one time. Any faulty units found by the inspector are pushed to the side tracks, where they are repaired. As the tests are completed, the unit continues over monorail to the final test department. There are several rows of test boxes here, over each of which is a line of monorail. After each line of monorail is filled with units, the test boxes are raised to the units by air cylinders. These boxes are equipped with measuring instruments and completely inclose the refrigerating unit.

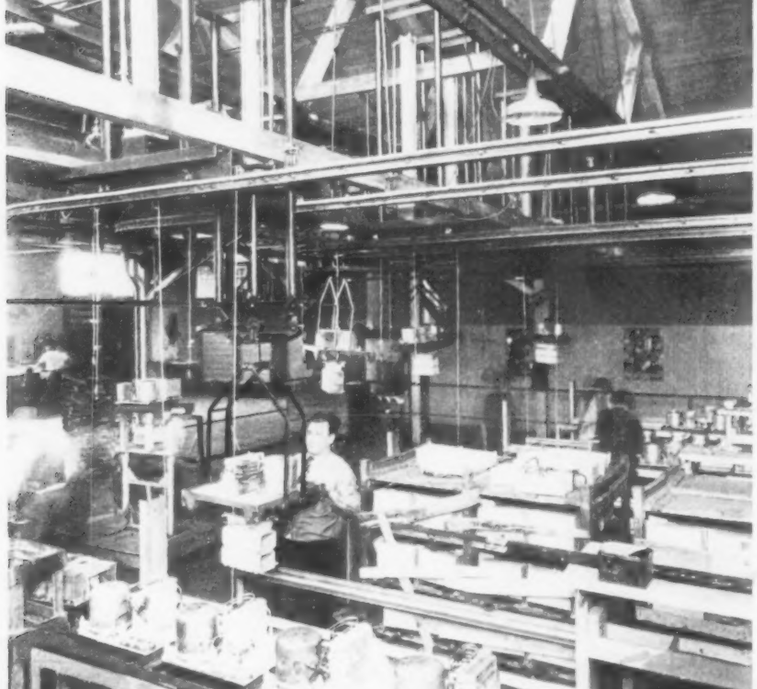
It is here that the power or refrigerating tests are made, and charts plotted to show whether the unit is functioning satisfactorily. This, the last and most important test before placing the unit in the cabinet, requires several hours. Units not operating perfectly at this point are switched back to the repair department, while the others go on to the final sealing.

Grabs Return by Gravity

After sealing and final inspection, the unit is pushed by hand over a short double-track section. This double track is raised by a foot lever, pushing the unit up from the dollies. The special grab is removed and conveyed by gravity to a booster, which elevates it to a higher level so that it will return by gravity to the discharge end of the oven. The unit is taken from this track by an air-operated hoist and conveyed by a monorail overhead traveling crane to a waiting truck, in which it is taken to another part of the plant to be placed in its cabinet.

It is hard to estimate the amount of savings brought about by this monorail system. But we do know that it would be practically impossible to have worked in any other type system in the old buildings which were available. We, of course, use practically every other type of conveyor made, but the general handling is based upon the use of monorail in this department.

At other points in the plant small systems of monorail and monorail cranes are used. The incoming sulphur dioxide gas is received in cylinders weighing 2800 lb. These are unloaded from the car and placed in storage by means of monorail and electric hoists.



▲ ▲ ▲

Units traveling by gravity along the ceiling are lowered to assembly benches by means of air-operated drop sections. The unit travels on the angle assembly track, while trolley and grab are raised and travel by gravity to the other end of the bench. Here the unit is picked up again by means of another drop section and goes back on the gravity monorail system.

▼ ▼ ▼

UNUSUAL STEEL FLOORING DESIGNED FOR SAVING WEIGHT

THIS shallow-arched floor section, made from steel plates, has been found advantageous in places where weight of structure must be light. The installed shape is, in effect, that of I-beams.

A NEW pier constructed by the Erie Railroad in Weehawken, N. J., carries three stories of storage and warehousing facilities on a foundation designed for only two stories. An extended description of this unit, telling in detail what was the problem in building the larger structure, is carried in a recent issue of *Railway Age*. The pier is a steel frame, fireproof structure, 739 ft. long and 97 ft. wide, supported on untreated timber piles.

Underlying soil conditions where these piles were driven made a limiting factor on weight. It was felt that it would be unsafe to impose a load of more than 15 tons on each pile. The structure had been calculated for two stories; when it was decided to increase the height, the first deck had already been built. The design for a two-story structure would have imposed a load of 13 tons. The addition of a third story, carrying the load far beyond the allowable limit, made it necessary to redesign the whole building.

Designed for Battleship Deck Floors

Battleship deck construction was first considered for the second and third floors and the roof. In this design the roof was to consist of 3/16-in. steel plates 30 in. wide, welded or riveted to 5-in. I-beam purlins on 30-in. centers. The third floor was to be made up of 5/16-in. steel plates 24 in. wide, welded or riveted to 8-in. I-beam joists on 2-ft. centers. The second floor was to be the same as the third, except that the plates were increased to ⅜-in. thickness and the I-beams to 10-in. depth. On this basis, with the live loads on the various floors as designed, the loading figured out at 14½ tons to the pile, which was within the allowable limit.

Another type of floor construction was suggested, however, and ultimately adopted, which permitted the three-story structure and promised a number of incidental advantages and economies. In this new system each floor consists essentially of a series of channelplate sections newly designed, pressed from open-hearth steel plates of varying thickness into a shape resembling a channel. The tops or broadest surfaces of these channels are arched to provide a standard crown height of ¾ in.

Channelplate Floors Finally Used

These channelplates are laid adjacent to each other with their concave surfaces downward, bringing the webs of adjoining plates together. The double webs thus formed are bolted together and, with their respective flanges, form I-beam sections at intervals corresponding with the width of the plates. The channelplates are carried at their ends on the girders of the structural supporting frame, their lower flanges being bolted, riveted or welded to this frame. Any desired wearing surface may be placed upon these channelplates, as with other types of construction.

As applied to the pier, the channelplates are 18 ft. long and are riveted at their ends to the girders. On the second floor they are made of plates ¼ in. thick and as formed are 19 in. wide and 9 in. deep, with 3¼-in. flanges. On the third floor, where a lighter load will be carried, the plates are the same thickness, but the width is increased to 24 in. and the depth decreased to 8 in. In both cases the plates are crowned the standard ¾ in., and adjacent plates are bolted together by nine ⅝-in. bolts spaced equally.

In addition to its quality of lightness, the channelplate construction afforded a number of other advantages, including simplicity and uniformity of sections, and speed and economy of erection. It could be built up as fast as its supporting framework and without the use of temporary framework or shoring. This not only resulted in fast and economical erection, but allowed clear space beneath each floor for work going on there.

Inasmuch as the channelplates provided a closed working floor as fast as they were set in place, access to each floor for further construction operations was immediate. Furthermore, the solid floor provided an element of safety for all workmen operating either above or below it. The channelplate floor construction was designed and fabricated by the Truscon Steel Co., Cleveland.

ALLOY STEELS AND ALLOYS FOR

By L. W. SPRING
Chief Chemist and Metallurgist,
Crane Co., Chicago

BESIDES the effect of insufficient tensile strength for resistance to fiber stresses and taking care of creep, the question of fatigue of the metal often is brought up. While fatigue of over-stressed metal is an extremely important factor at the lower temperatures, it becomes a much less serious factor as the temperature of operation rises. Apparently, at temperatures of 750 deg. F. or over, namely, temperatures of operation of the modern steam plant, fatigue has lost most of its importance as a factor. Therefore it generally is considered that fatigue and creep factors are opposites and that one decreases as the other assumes importance.

In addition, the question of corrosion, caustic embrittlement or other corroding condition must be looked out for. Naturally, metals must be used which are not eaten away, which in effect would be to reduce the metal thickness, and therefore the strength of the structure.

These considerations give some of the rather serious questions that confront the modern power plant designer, the construction man, and the metallurgist who directs the making of the steel.

Boiler Shell and Pressure Containers

To return to the question of materials and construction, piping valves and other equipment—the boiler shell, headers, piping and, to a certain extent, valve bodies, are parts of the equipment which can be allowed to breathe or weave about somewhat and, in general, they quite easily can be built with sufficiently thick wall to give strength for the purpose designed. On the other hand, the interior or working parts of the valve, consisting of the seating arrangements which have to fit tightly to close the valve satisfactorily, and parts of the steam turbines which use the steam, have to have and maintain, for the period of operation, particularly nice fit and adjustment.

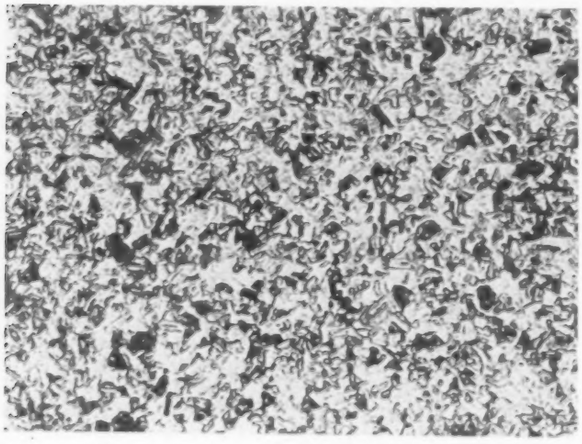


Fig. 4—Microstructure, as rolled, of austenitic chrome-nickel steel (18-8), 100 diameters, etched with aqua regia.

The boiler and the tubes, of course, maintain a particularly high temperature, and tubes usually from 100 to 200 deg. higher temperature than the shell—a total of 900 to 1200 deg. F. for 750 or 1000 deg. F. steam. Tubes formerly have been made of carbon steel, but, now that we are getting into the higher temperatures of 850 to 1000 deg. F., they are being made of stainless steels and, more lately, the 18-8 metal (18 per cent chromium, 8 per cent nickel)

The boiler shell, headers and the piping are made of carbon steel, these carrying steam at temperatures not higher than the specified 850 to 1000 deg. F. With the still higher pressures which are contemplated and the full 1000 deg. F. steam, metals of better physical properties than carbon steel are being considered.

New and More Serviceable Materials

New steels are evaluated in a prospective way by their higher physical properties cold, and in the laboratory at higher temperatures up to 1600 or 1800 deg. F., or more. Their coefficients of expansion, resistance to oxidation and corrosion, their availability, workability or ease of preparation, reasonable cost, etc., also have to be considered.

Steels containing small amounts of nickel and chromium, such as the S. A. E. 3100 and 3200 series, the S. A. E. 6100 chrome-vanadium, the manganese alloy steels, the well-known high-chrome rustless steels and many others have been tested but, while considerably stronger at ordinary temperatures and a little stronger at elevated temperatures, are found to suffer much the same loss in strength at high temperatures as do the ordinary carbon steels.

The austenitic steels, such as the 18 per cent chromium, 8 per cent nickel, with or without silicon, manganese, molybdenum, tungsten, etc., the reverse combination with 8 to 10 per cent chromium and 17 per cent nickel, the 35 per cent nickel and 20 per cent chromium steel, and a host of others, are being

HIGH-TEMPERATURE SERVICE

IN this, the second and concluding portion* of the author's recent address before the Western Power Congress, Mr. Spring discusses the use of austenitic alloy steels, such as the chrome-nickel and others, pointing out their advantages and disadvantages. Their chemical stability remains to be settled.

Requisites of a metal for valves and valve seats are enumerated and some of the merits of the non-ferrous metals used are reviewed.

The success of Nitralloy as a new metal for seating valves is mentioned, with reasons for its availability.

Metallurgists and steel makers will meet the new high-temperature and high-pressure demands of industry.

tested in this laboratory and in trial installations.

While the austenitic steels show less loss of strength at the higher temperatures than do the "pearlitic" varieties, the question of chemical stability yet remains to be settled. With some "austenitics," apparently, there is a tendency to precipitate carbides upon long heating at certain temperatures, this, perhaps, tending toward brittleness.

The austenitics have the further disadvantage of extreme toughness in working which makes their rolling, piercing for tubes, drawing and cutting with tools extremely slow and expensive. As a class, they are difficultly workable and this toughness promises to keep the cost of equipment made from them well up, for the present. They have, of course, the great advantage that they do not rust as does ordinary steel and therefore they are desirable, but this factor, comparatively, is a less important one.

Valves

The valve is a mechanical device for controlling the steam. Naturally, it consists of a body, a bonnet or cover, what are known as seats (body rings and a disk or plug which also has corresponding rings), a stem which closes the disk in the gate valve to plug the opening and shut off the supply of steam. Certain other miscellaneous parts need not be considered. Naturally, the body, like the pipe which conveys the steam, must be strong enough and contain metal enough to maintain its rigidity and hold the pressure. A reasonable extra thickness of metal in the body ordinarily is not a great handicap.

Closure of a valve must be perfect if steam, gas or other fluid is to be prevented from leaking through the valve. The seats not only must be well designed and manufactured to close perfectly tight against each other to prevent leakage past the seat, but they must be made of materials which do not rust or corrode and which do not become scratched when a piece of pipe scale or dirt lodges between them while they are closing. Some metals, too, actually "seize" or abrade each other when their surfaces rub, though such may occur with one fluid, such as steam, when it will not do so with another, such as oil.

It will be realized that a slight scratch or imperfection, whereby a slight amount of steam or other fluid at such high pressures can start to leak through, allows such an imperfection rapidly to wear larger, resulting shortly in the impinging stream of fluid through this cut doing serious damage where it strikes, sometimes a hole being cut entirely through the wall of the valve where such a stream impinges. A seat-leaking valve is not serving its function in the first place and the necessary removal of the valve shortly afterward, due to non-tightness and sometimes to a cut through the wall, interrupts

Fig. 5—Microstructure of austenitic chrome-nickel steel (18-8), 100 diameters, etched with aqua regia. "After water quenching from 2100 deg. F. (1150 deg. C.)."

*The first part of the address appeared in THE IRON AGE of March 26 and covered the uses of ordinary steels in high-temperature service.

the pipe line service seriously and cannot be countenanced.

The seating metal chosen, therefore, and its accurate manufacture and fit in the valve, is a most important matter since the tightness of seat may be considered the life of the valve. Brass, monel metal, nickel alloys, rustless steels, and some harder alloys are used, depending upon the service desired. The corrosive influences spoken of before, the hardness, coefficient of expansion and several other qualities, must be taken into consideration in selecting metal for service in seats.

Requisites of a Valve Seating Metal

From the metallurgist's standpoint, the question of seating metals presents, therefore, a considerable problem, some of the many characteristics necessary for a proper one being:

Non-corrosiveness.
Proper coefficient of expansion.
Forging or casting quality.
Machineability.
Density and smooth texture.
Proper strength and ductility.
Hardness sufficient to withstand scratching.
Non-galling or seizing quality.
Reasonable cost.

New metals and alloys, satisfactory from the purely non-corrosive standpoint, often would be available except that the fabricating cost is prohibitive. Some do not cast satisfactorily. Some cannot be rolled or forged, or are so tough that machining is not possible from a production standpoint. The best material may be so costly from the standpoint of time and labor to fashion it that a somewhat shorter lived but reasonably priced material really may be a better choice, when cost of shutdown and labor in plant to replace a spoiled valve is not excessive.

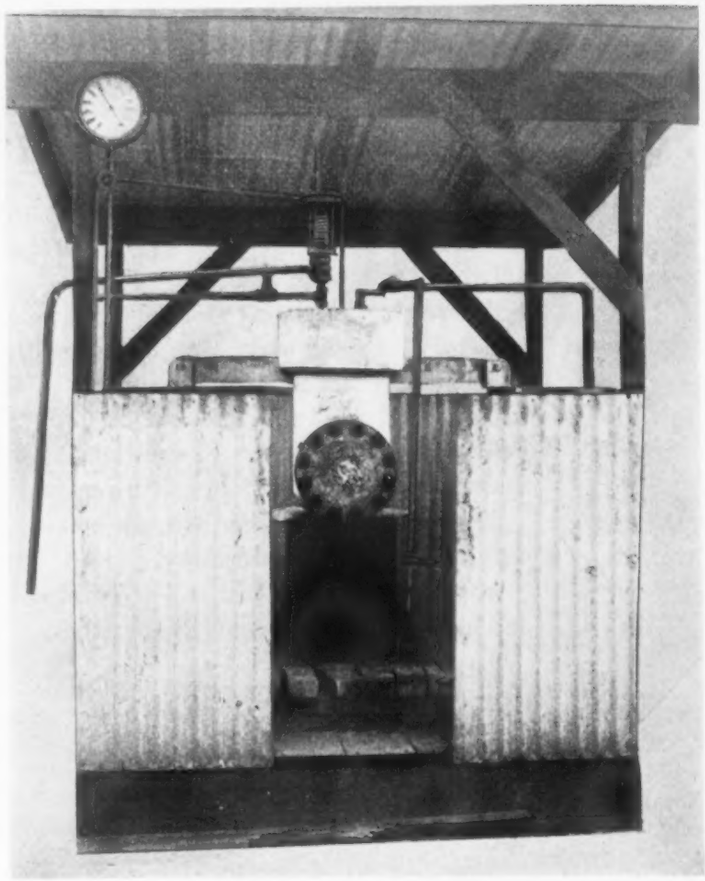


Fig. 6—Corrosion testing apparatus for testing samples of alloys under vapor pressures of various petroleums up to 200 lb. per sq. in. and 700 deg. F. temperature.

It is fortunate that the seating parts of the valve are of small weight comparatively, for fairly costly metals can be used, if necessary, without prohibitive expense. For example, silver is used in the seating of some valves for chlorine, because of its excellent service on moist chlorine gas and the limited amount of the metal required.

In general, seats of cast materials seize and tear each other less than forged or rolled metals, metals of high hardness less than those of low hardness, metals of somewhat different hardness less than those of approximately equivalent hardness and dissimilar metals probably less than seats of like metals. These considerations are explained mostly on the theory that the same metals have the same type and ordinarily much the same size of grain, thus giving rubbing surfaces with like projections and interstices which facilitate grabbing or interlocking of crystals.

A multitude of friction and seizing tests have been and are being made on metals of all kinds under various pressures and conditions of temperature, etc., to determine experimentally the best combinations for seats. It is likely that such rather extensive tests as are now in progress will result eventually in a revision of some of the so-called laws of friction, which apparently have been copied and re-copied over a very long period from one handbook and textbook to another. These apparently originated at some date far back.

Valve Seat Metals for Steam Service

As stated, high nickel-copper bronzes of 50 per cent or more of nickel were used in high-grade valves for steam service for many years. These are non-corrosive under ordinary circumstances, are strong, have ductility enough that they can be "rolled in" or fastened into valve disks in other ways than by threading and screwing them in, have a satisfactory coefficient of expansion, can be forged and cast satisfactorily, have fair machineability, and some of them are readily available in quantity, shapes and sizes. Such were quite satisfactory until the higher pressures and temperatures made service conditions extremely severe. They still are considerably used but they have the disability of "seizing" and roughening when two surfaces of the metal slide against each other under heavy pressure.

This "seizing" is a real disability, since a torn and leaky seat starts "wire drawing," which brings on yet more serious leakage if perchance it was not serious enough already. The pressure on the seat-

ing surface under a 900-lb. load on one side of the disk of a 16-in. gate valve, for instance, is estimated to be approximately 5000 lb. per sq. in. Materials that will stand rubbing together under such pressures must have certain characteristics, which are not yet definitely understood. Cast iron for the lower temperatures was good because of its more or less self-lubricating seat, due to its content of graphite. The copper-tin bronzes are fairly good from the standpoint of "seizing," but, as previously stated, they have the disability of high coefficient of expansion and low melting point. The addition of tin or other hardening element to the copper-nickel bronzes helps materially and some of these are giving good satisfaction in present day service.

Nitralloy—a New Seating Metal

How much a factor, in resisting seizing and scoring, "hardness" of the material is, is not definitely known; though, other things being equal, hardness is quite a factor. The extremely hard, case-hardened carbon steel with 700 Brinell makes a good seating metal so far as this one matter of "seizing" or tearing is concerned, but it is not non-corrosive, and a valve seat which rusts under ordinary conditions of moisture, of course, is impractical.

A comparatively new seating metal, Nitralloy, has appeared. Nitralloy is a forgeable steel containing small proportions of chemical elements which cause its surface to become glass hard when heated to 900 or 1000 deg. F. for a period of hours in a stream of dry ammonia gas. This case or coating, which usually is from 10 thousandths to 30 thousandths inch thick, depending upon the length of "nitriding" treatment, is non-corrosive under ordinary circumstances, does not seize or tear and has the peculiar and happy advantage of becoming smoother as it wears. Nitralloy is giving quite satisfactory results in steam service.

The Modern Steam Turbine

Some of the highly refined developments in physical tests of metals at elevated temperatures relate very intimately to the behavior of the metals in the modern steam turbines which are now operated at temperatures upward of 850 deg. F. In this application, parts must be designed to withstand severe pulsating stresses for indefinite periods of time. It is claimed that the total amount of deformation due to creep which can be tolerated in turbine parts must not exceed 0.2 per cent in 20 years.

With such exacting limitations within which to work, the engineer concerned with turbine design naturally is cautious to a fault. The casing or shell must be rigid in order that the moving parts inside, which are light but with very small clearance allowed, may always run smoothly. These casings usually are of steel, either cast or fabricated materials. The blades inside usually are of monel metal, or stainless iron, of 18 and 8 metal, etc. Like the critical parts of the valve, these must be of non-corrosive metal.

We have advanced far since those days of 1905 or thereabouts, when the world's largest turbine of 5000 kw. was made for the Commonwealth Electric Co. of Chicago, which operated under steam pressure of 200 lb. and temperature of 500 deg. F., to the present 208,000-kw. turbine which recently was installed at the State Line Station, Chicago. This latter uses steam at 600 lb. pressure and 750 deg. F. The new addition to the State Line Station, while having two smaller generators in place of a large one, will use steam at pressure of 1400 lb. and 825 deg. F. temperature.

And the end is not yet. We are quite definitely asked for materials to operate practically continuously during ten years or more at pressures of 2500 or 3500 lb. and temperatures up to 1000 deg. F. Who doubts that this is possible? Judging from recent progress, the possibilities seem more or less limitless, considering not necessarily materials, but methods. Committees of various engineering societies are hard at work, as also are metallurgists, steel makers and engineers, and valuable results will be forthcoming.

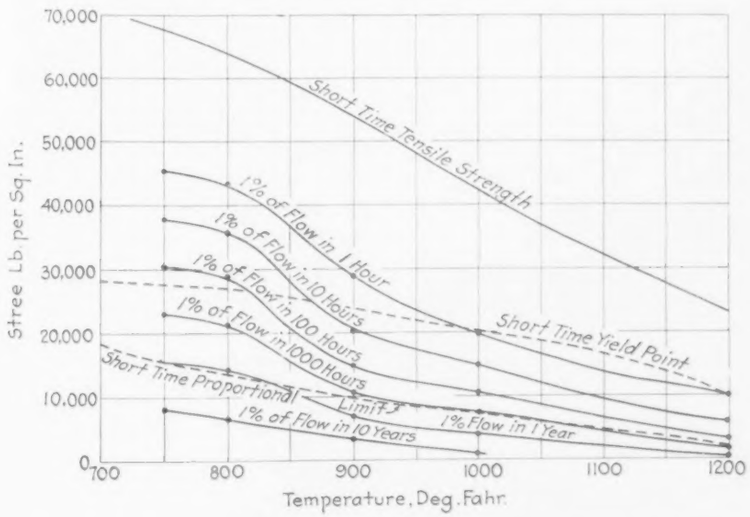


Fig. 7—Flow rate curves for 0.33 per cent carbon cast steel with short-time tensile, yield point and proportional limit drawn in for comparison.

50th Anniversary of the Genie Civil

MARKING a half-century milestone of engineering in all its ramifications, our French contemporary, *Genie Civil*, established in 1880, has put out a splendid publication containing articles by leading authorities along each of some dozens of engineering lines. Bridges, ships, aircraft, railroads, metallurgy, steel and non-ferrous metals, machinery of many types, electrification, chemical engineering, ventilation, architecture, telegraph and telephone, mining, dock, and port construction have been covered in picture and story with great care. This volume of 236 quarto pages deals not only with conditions in France, upon which of course the greatest stress was laid, but also with the concurrent progress in these many lines in other countries as well.

SYNCHRONIZATION OF CONTROL WITH CONVEYOR EQUIPMENT

MASS production methods, first utilized in a large way in the automotive industry a dozen years ago, have revolutionized industrial practices throughout the world. They have resulted in tremendous economies, changing living conditions and the social status of many peoples. Our higher standards of living must in large measure be ascribed to the reduced costs brought about by these methods.

This subject is discussed in some detail in a paper to be presented at the National Industrial Congress, Cleveland, April 15, prepared by E. M. Olin, works manager, Westinghouse Electric & Mfg. Co., Mansfield, Ohio, and W. E. Beattie, director of production at the same works. The paper was a contribution to the congress through the American Society of Mechanical Engineers.

There is plenty of evidence, says the paper, that the American workman in a modern factory, using mass production methods, is today better housed, better paid and better satisfied than ever before. While his average output may be from two to three times the former production, this increase is due to numerous labor-saving devices and to better handling facilities. In general, the workman has an easier physical task now than before.

Making Electric Devices on Conveyors

This paper describes production control in the partly conveyorized Westinghouse plant at Mansfield, where 1500 operatives produce the domestic and commercial heating devices marketed by that company. These include electric ranges, flat-irons, toasters, grills, bread ovens, and the like, together with industrial heating equipment, icing units for refrigerators, safety switches, etc. Of these various units, 300 devices in all, the flat-iron runs into hundreds of thousands annually, while some of the others represent a yearly production of only 200 to 300 units.

A conveyor system provides three definite things: Transportation, a definite speed or time element, and a definite routing. Its value may depend on any one of these things or on a combination of any two or all three.

Installation of a conveyor 36 ft. long for assembling cords, with an attachment plug on each of the cords, has resulted in a production of 1500 flat-iron cords a day by six girls working 9 hr. Each girl has a par-

RANGE CONVEYOR ASSEMBLY — JANUARY 1931

QUOTA — 125 PER DAY ON CONVEYOR

DESCRIPTION	L OR R	QUANTITY	1 2 3 4 5	6	7	8	9 10 11 12	13	14	15	16 17 18 19	20	21	22	23 24 25 26	27	28	29
C 431 — GREY	L	200	105	95														
	R	300		10	105	105	80											
C 631 — GREY	L	250					25	105	105	15								
	R	350								90	105	105	50					
C 831 — GREY	L	100											55	45				
	R	200												60	105	35		
C 841 — GREY	L	100														70	30	
	R	200															75	125
CR 842 — GREY	L	125	20	20	20	20	20	20	5									
	R	175							15	20	20	20	20	20	20	20	20	
CH 631 — GREY		100	DELIVER 13 PER DAY (5TH THROUGH 15TH) BENCH															
CL 621 — GREY		100	DELIVER 13 PER DAY (19TH THROUGH 29TH) BENCH															
TOTAL		2200																

SCHEDULE for range assembly on conveyors at 125 ranges a day during a month. The total calls for 2200 units and these are distributed on an equable basis through the successive manufacturing days of the month.

COORDINATION of the various elements of production, so that finished parts, sub-assemblies and other materials meet on assembly lines when needed, has proved to be a large element in cost saving.

Some of the factors involved in this program, whereby the whole system may be made to operate most effectively, are brought out in this article. Definite savings in assembly costs are traced to utilization of such a scheme, with its combined pace-setting and time-saving elements. Less storage space is required and less physical handling of materials, thereby further reducing the cost on these operations.

ticular operation to perform. By means of the conveyor the assembly time was reduced from 13 girl-hours per 100 cords to 7½ hr. This reduction of 45 per cent represents a 2c. saving on each cord, and on 500,000 cords a year means $10,000 saved on this one item.

Groups of Operations Served by One Conveyor

Study of one department which assembles a considerable variety of smaller appliances, including toasters, waffle irons, hot plates, bowl-type radiant heaters, etc., showed a great similarity in some of the fundamental assembly operations. All have wire-wound heating elements of similar design. All have frame work or bodies consisting of sheet-metal parts held together by hollow rivets. All are electrically tested in about the same way after assembly, and are packed in cartons of about the same size and design.

While not one of these devices had enough volume to justify a conveyor set-up, one conveyor has been installed for the group, and the different devices are run through consecutively at different times during the monthly production period.

For example, toasters may be run at the rate of 1000 a day for 10 days. Then waffle irons at 500 a day for 10 days, hot plates or radiant heaters at the same rate for the same period, etc. Thus the advantage of conveyor economies is gained, although not one device had enough volume to justify the installation expense.

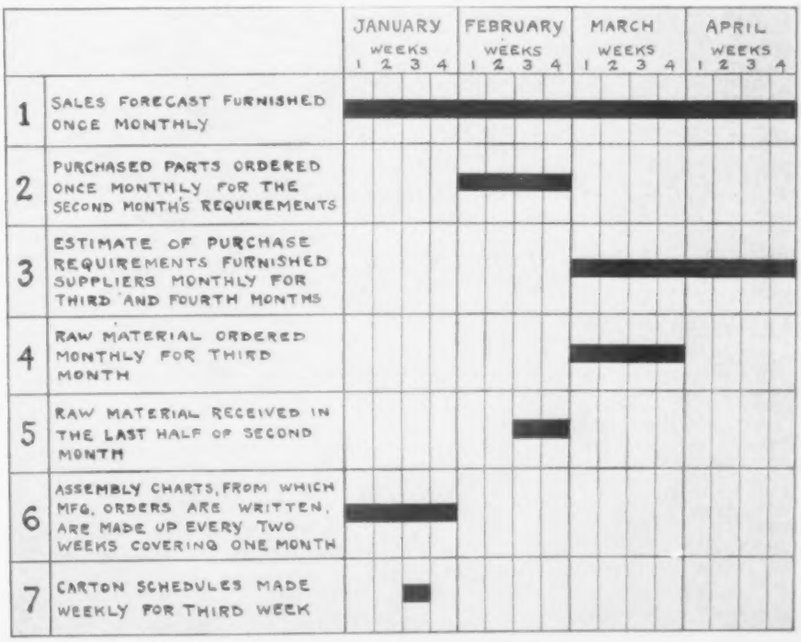
While this is a special condition, it indicates that conveyors may be employed advantageously in many cases which, at first glance, do not appear to be susceptible to such treatment. In this way assembly labor on each of these devices was reduced about 35 per cent.

Keeping Units Coordinated

In most factory operations, under the old methods, there is a tremendous loss of time from lack of coordination. This does not appear on the surface and yet a large proportion of the obvious activity may be superfluous. One great advantage of the use of a conveyor in manufacturing operations is that it shows up this superfluous activity and forces the correction of the myriad abuses of haphazard manufacture.

This means that, with the conveyor, there must be production control of a very high order. Work must flow from operation to operation, or from process to process, in an orderly way and without delay, and in a predetermined sequence. Not only must each individual operation be time-studied; the different operations all along the line must be tied together or balanced in

METHOD of preliminary control based on sales forecast. This shows when the various parts will be put into process, in accordance with scheme worked out in coordinating manufacturing operations and providing adequate advance control over them.


JANUARY
FEBRUARY
MARCH
APRIL
WEEKS 1 2 3 4
1 SALES FORECAST FURNISHED ONCE MONTHLY
2 PURCHASED PARTS ORDERED ONCE MONTHLY FOR THE SECOND MONTH'S REQUIREMENTS
3 ESTIMATE OF PURCHASE REQUIREMENTS FURNISHED SUPPLIERS MONTHLY FOR THIRD AND FOURTH MONTHS
4 RAW MATERIAL ORDERED MONTHLY FOR THIRD MONTH
5 RAW MATERIAL RECEIVED IN THE LAST HALF OF SECOND MONTH
6 ASSEMBLY CHARTS, FROM WHICH MFG. ORDERS ARE WRITTEN, ARE MADE UP EVERY TWO WEEKS COVERING ONE MONTH
7 CARTON SCHEDULES MADE WEEKLY FOR THIRD WEEK

such a way that there will be no lost motion. All of this requires expert planning.

Planning Goes Back to Sources

In the plant under description a graphic control plan is used for each assembly conveyor. From this chart a plan is made of each component part back through the finishing department, the fabricating department, etc., to the raw material requirements. Every part is checked monthly and each day's performance is indicated on the feeder and assembly charts.

Such a definite routing plan requires less supervision. This fact tends to raise the function of the foremen, who have become very active in cost reduction work. This was not possible when their time was taken up with the daily routine of following work to see that schedules were met.

Reduction in amount of work-in-process inventories is one of the greatest savings of the conveyor system. Under the old scheme parts were built for assembly from one to three months ahead of the time of actual assembly. Many extra handlings were required and much space used in storage. Sometimes, due to changes in schedule and design, the parts became obsolete and had to be scrapped.

With the conveyor plan, stocking of parts is reduced to as near zero as possible. "A rapid assembly and a good turnover" is the slogan. Inventories of raw materials for work in process have been reduced more than 25 per cent. Except for many small-volume articles, which must be carried for commercial reasons, this reduction might have been much greater.

Graphic Control Plan

Sales are forecasted four months in advance. Raw materials are provided against that forecast, depending upon the time required to secure them. Production promptly starts when the work control schedule is received.

Graphic load sheets are built up for the entire schedule for all types of ranges, for instance. This is two weeks in advance of the time when final assembly is to start. The charts cover a four-week assembly period.

Three major factors determine the load chart's value: Commercial requirements; facilities and materials available, as reflected by individual tooling for each type of range; and operating efficiency.

Colors Show How Performance Matches Schedule

Loads on the different manufacturing sections are plotted graphically, using figures and a blue bar for the proposed load, and a red bar to show the performance against that load. Opposite each range, under the working days or portions of working days in the month, the bars and figures indicate the time of assembly and later the performance.

Parts are handled in the same manner, by means of graphic load charts prepared on the fourteenth and the last days of each month. Each chart, as before, shows the load for four weeks, the first two weeks being the last two of the next preceding chart, and the second two weeks an extension thereof.

Perhaps the greatest obstacle to successful conveyorized control is a sudden change from one type of device to another to meet some commercial demand. The control set-up briefly described here can be changed for the whole plant in 12 hr. by means of the chart system. Any type of range wanted can be produced within two weeks.

No part of the production is started more than two weeks before its assembly begins. Many parts are made and finished as used. With parts fabricated and finished to synchronize with assembly requirements, the entire manufacturing is in tune. Rapid revision of schedules is simple and obsolescence of materials is avoided.

In the paper the details of handling physically the

(*Concluded on page* 1100)

RAW MATERIAL CARD

CARD NO. 68 P.D.S. 3908

DESCRIPTION OF MATERIAL VITREOUS ENAMEL SHEET STEEL

DIMENSIONS .0375" x 27 3/4" x 81" WEIGHT 23.4 LB.

STYLE NO.	PIECES IN SHEET	W.P.M. NO. PCS.	W.P.M. SHEETS	JANUARY PCS. REQ'D.	JANUARY SHEETS REQ'D.	FEBRUARY PCS. REQ'D.	FEBRUARY SHEETS REQ'D.	MARCH PCS. REQ'D.	MARCH SHEETS REQ'D.	APRIL PCS. REQ'D.	APRIL SHEETS REQ'D.
521723	7	800	114	1100	157	—	—	800	115	700	100
668073	4	50	12	—	—	175	44	—	—	—	—
668074	4	50	12	—	—	225	56	—	—	—	—
691952	12	500	41	700	59	—	—	1100	92	1000	84
691953	12	700	58	900	75	—	—	1100	92	1000	84
TOTAL SHEETS REQ'D			237		231		100		299		268
WEIGHT PER SHEET			23.4 LB.		23.4 LB.		23.4 LB.		23.4 LB.		23.4 LB.
TOTAL WEIGHT REQ'D.			5450 LB.		6800 LB.		2340 LB.		7000 LB.		6270 LB.

DEC. ~~1780~~ 6800 LB.
JAN. ~~6800~~ 1780 "
FEB. 1780 "
MAR. 6640 "
17000 "
~~713~~ 1628 "WPM
~~16287~~ LB. 4 MO.

JAN 6800 LB.
FEB. 2340 "
MAR. 7000 "
APR. 6270 "
22410 "
5450 "WPM
16960 LB. 4 MO.

STOCK 7700 LB.
PURCH. ORDER 103985-60004 2/25
PURCH. ORDER 104099-60001 3/15

▲ ▲ ▲

RAW material card, corrected monthly. This shows at the bottom the effects of correction, December having been passed and the January schedule calling for the same amount as before. Expansion in the February and March schedules may be noted, while the April schedule has been added to the list.

▼ ▼ ▼

BRIQUETTING OF CAST IRON BORINGS AND STEEL TURNINGS

By A. K. NOWAK
District Manager, Baldwin-Southwark Corp., Chicago

IN the general economic drive for elimination of waste and utilization of waste materials, attention has been paid to cast iron borings and steel turnings. Large quantities of this scrap accumulate in the metal industry. It is estimated that, in New York State alone, 1500 tons of borings accumulate daily. The motor industry around Detroit, when in full production, will produce about 2000 tons of borings in a day. One prominent roller bearing plant in Ohio produces almost 300 tons of turnings in 24 hr.

These scrap materials have always been utilized by remelting. This recovery, however, has been far from complete, the losses, due to oxidation and consequent slagging off during the melting process, being very high. In addition, the resultant heat of steel is frequently ruined by the oxide entering the molten metal. The true metallurgical value of these scrap materials in their loose state, with present utilization methods, is truly reflected in their market quotations.

Cast iron borings will average $9 a gross ton when heavy melting scrap is quoted at $16 to $18, and pig iron at $22 to $24, indicating a possible recovery value of $9 to $15 a ton. Machine shop turnings will average $12 when heavy melting steel scrap is quoted at $17 a gross ton, making possible a saving of $5 a ton. The differences between these prices indicate how tempting the utilization of this scrap is, particularly when an iron or steel foundry is connected with the machine shop.

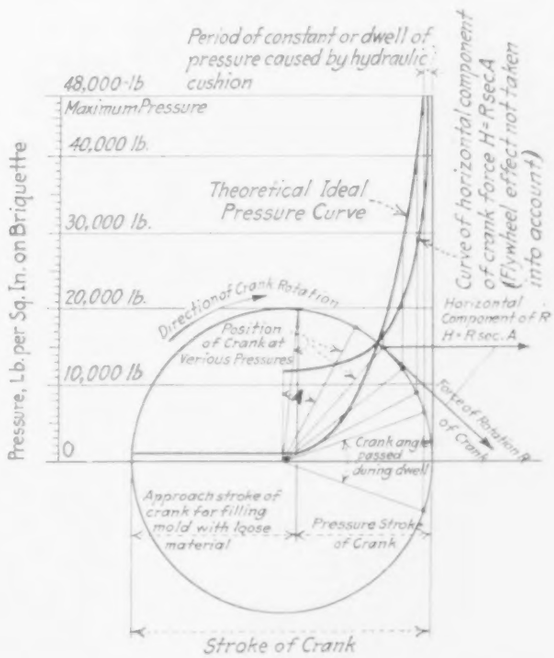
Here the management sees cast iron borings and steel turnings of its own refined metal, of known analysis and purity, sold at a very low price. Then, on the other hand, heavy melting scrap of somewhat mixed analysis, and pig iron are bought at much higher prices. In many cases, where expensive alloys are added to the metal, the loss is much higher. The borings or turnings from such alloy metals command only the prices of the common metals, no premiums being given for the alloys.

Previous Methods Tried

Various methods of better utilization, or recovery, have been tried in the past, and are still being used in some plants, but none gives good results. One method has survived and is still being used in some foundries: Cheap sheet metal cans are filled three-quarters full with borings and the tops battered in to close up the cans. It is assumed that the borings in the can sinter together, before reaching the melting zone. This method is uncertain and expensive, the cost of the cans and the labor of filling and closing them being charged against the recovery value.

Foundries which are particularly exact in their practice have refused to use borings prepared by any method, although large amounts of such scrap are produced within their own plants, and although the saving effected by its utilization is large and obvious. As it stands today, by far the greater percentage of cast iron borings are sent back to the blast furnace, and only part of the steel turnings are remelted in the steel furnaces.

Only one method gives satisfactory results in handling these materials. That consists in compressing them to such an extent as to reduce the proportion of surface to weight, as much as possible, and


Period of constant or dwell of pressure caused by hydraulic cushion
48,000 lb
Maximum Pressure
40,000 lb.
30,000 lb.
20,000 lb.
10,000 lb
0
Pressure, Lb. per Sq. In. on Briquette
Theoretical Ideal Pressure Curve
Curve of horizontal component of crank force H=R sec A (Flywheel effect not taken into account)
Direction of Crank Rotation
Position of Crank at Various Pressures
Horizontal Component of R H=R sec. A
Force of Rotation P of Crank
Crank angle passed during dwell
Approach stroke of crank for filling mold with loose material
Pressure Stroke of Crank
Stroke of Crank

APPLICATION of geared crank and flywheel to the pressure requirements in briquetting. The theoretical ideal pressure curve shown in pressing one briquette is based upon compressing the entrapped air and upon empirical constants for porosity and degree of granulation of material to be briquetted.

thereby bring the oxidation effect on the compressed blocks to a minimum. This method is called briquetting, and the compressed blocks are known as briquettes.

Europe Finds Value in Saving Wastes

This briquetting method has been practiced for some years in Europe, where the utilization of waste materials has been of considerable importance, due to the vital necessity of conserving the limited natural resources. In recent years the briquetting of cast iron borings and turnings has developed into a new and independent industry of considerable proportions, more than 30 plants being situated in various industrial centers throughout Europe.

Smaller establishments, with insufficient quantities of scrap to have their own briquetting plants, have combined and financed central plants, send in their borings and turnings and receive their own metal back in the form of briquettes. The recent success of this method is due to a new process of briquetting, using exceedingly high end-pressures on the briquettes by means of powerful hydraulic presses.

Some years ago this process was introduced into this country and a plant was built in Cleveland, exactly along European lines. The machines had a comparatively small output, each producing four briquettes a minute. They required a considerable amount of labor, being loaded by hand, and were very expensive to maintain. In briquetting steel turnings it was necessary to disintegrate and crush the turnings to facilitate the filling of the vertical briquetting mold. After operating about a year, this venture failed, due to high operating costs. The German briquetting machine simply had not met American economic conditions.

Entrapping Air to Cushion the End Pressure

A machine to meet these conditions was then developed by us. The design is based on the fact that a granular material, when under pressure, will react against this pressure at any moment of the pressing operation, according to the amount of air entrapped in it at that time. This amount of air in turn depends on the specific gravity, porosity and degree of granulation of the material. From this it is obvious that it is important to make provisions and allow time for the escape of the air. This is increasingly necessary as the material becomes denser and the end-pressure is approached.

By plotting this law, using the horizontal ordinate as time in seconds of the pressure stroke, and the vertical ordinate as pressures in pounds per square inch, an ideal pressure curve is attained, which illustrates the briquetting operation under the given specifications. The conditions indicated by this ideal curve are almost fully met by a pressure crank of a mechanical crank press.

These considerations led to the development of a combination mechanical and hydraulic press, fully automatic, of maximum speed and altogether foolproof. It is essentially a direct motor-driven, horizontal, crank press with an hydraulic cushion interposed between the crank and the briquetting plunger. This cushion does not react until an adjustable predetermined pressure is reached.

SAVING the inherent value in machine shop refuse ferrous materials, without undue oxidation in the furnace, is the main object of briquetting cast iron borings and steel turnings. In this paper, to be presented April 13 at the second National Industrial Congress in Cleveland, under the auspices of the American Society of Mechanical Engineers, the author describes the process in some detail.

Consequently, in a machine capable of producing 300 tons pressure, the machine will compress the charged material up to 300 tons pressure, acting during this time exactly as a simple crank press would. But at this 300-ton pressure the hydraulic cushion will take effect, so that this pressure cannot be exceeded and is maintained during the remainder of the crank angle. This not only protects the machine against over-loading, from varying amounts of material being charged into the mold, which cannot be controlled, as it is automatic, and from solid pieces of steel and iron being mixed in the material, which is more the rule than the exception; but it also produces a time period of constant, or dwell, of pressure, during which the briquette is set. That is, time is allowed for the final air to escape, while the briquette is under its maximum pressure.

Such machines have been built for cast iron borings and for steel turnings. I shall first describe the process of briquetting steel turnings.

Briquetting Steel Turnings

This material, as is well known, is of greatly varied nature. Some kinds are long and in spiral shape, others fluffy and flaky, and others again tightly rolled curls. As they are gathered at the various machine tools, these are indiscriminately mixed together. They are covered with oil used in the machining operation. Recovery of this oil is an independent economic matter.

There are two methods: One method, used and patented by the Timken Roller Bearing Co., consists of conveying these turnings through an inclosed chamber, in which hot water is sprayed under high pressure from a series of nozzles. This washes the oil off the turnings and chips. The water and oil then accumulate in settling pits, the oil is separated from the water and is refined and returned to the machine shop. The other method, used by Deere & Co. and

Packard Motor Co., consists of first cutting or crushing the turnings in a hammer mill, and then running the crushed material through a centrifuge, thereby recovering the oil.

Our briquetting machine can be arranged for both uncrushed and crushed turnings. In the former case, for turnings as they are produced at the tools, the machine is equipped with a force-feed hopper, consisting of a series of reciprocating toothed bars, which by means of suitable driving members receive a definite feeding or raking motion. A platform is built over the machine, level with the top of this hopper, the turnings are deposited on this platform by an electro-magnet, and a laborer rakes them continuously into the hopper. The teeth in the rakes of this hopper pull and force the turnings into the briquetting magazine of the machine, at the same time giving them a preliminary compression.

Product in Units of About 25 Lb.

The briquettes produced are cylindrical, 7 in. in diameter by 3½ in. high, weighing from 24 to 27 lb. each. Their density is from 65 to 70 per cent as compared with solid steel. They are produced at the rate of six a minute, giving an hourly production of 4½ net tons. The pressure exerted on the briquettes is 15,000 lb. per square inch, or 300 tons total. The briquettes are hard and dense, and withstand any rough handling. The machine is direct driven from a 75-hp. motor.

These briquettes form an excellent charging scrap for electric and open-hearth furnaces. The bulk of the material as compared to loose turnings is decreased in the ratio 1 to 12. The ease of handling in charging, the saving in the number of charging boxes used, the resulting longer life of furnace roofs, contribute considerably to the saving effected. Metallurgically, the briquettes are fully equal to heavy melting scrap.

These briquettes will melt gradually without disintegrating. Outside of the usual oxidation on the surface, none takes place on the inside, which has been proved by exhaustive tests. The operating cost, including 10 per cent depreciation, interest on investment, labor, power and all other charges, does not exceed $1.50 a net ton. The annual output of the briquetting plant is approximately 13,500 net tons, in single 10-hr. shifts and 300 operating days a year.

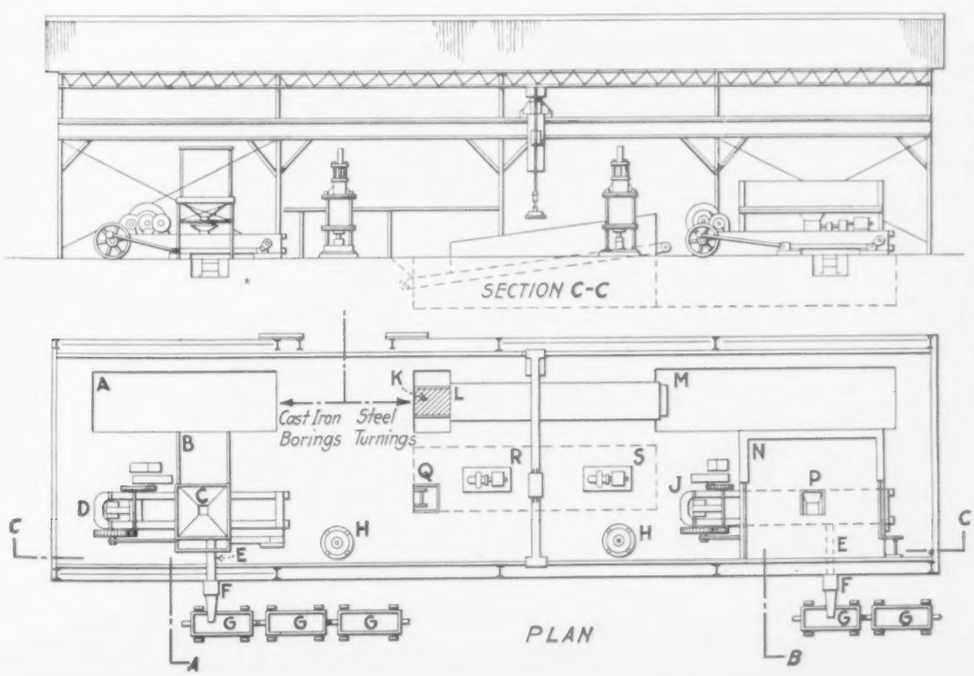
At the Timken plant three such machines, with a total capacity of 300 tons of briquettes, are in operation. One of them has been working for eight years and the other two for two years, indicating the excellent economy derived from their use. Previous to briquetting, this company sold its turnings, but since eight years ago has briquetted and melted every pound of turnings produced. The company derives an additional and considerable saving from recovering the high percentage of molybdenum and nickel, alloyed with the steel.

Briquetting Iron Borings

Machines for briquetting borings are in operation at many plants, including several automobile plants.

These machines can be built for various production capacities. Our largest, so far, has been for 4 tons of borings an hour; our smallest, for 2000 lb. an hour. The larger machine makes briquettes 4 in. in diameter by 3 in. long, weighing on the average about 8 lb., and having a specific gravity of about 5.7, or a density of 80 per cent as compared with solid iron. The pressure used on these briquettes is 46,000 lb. per square inch, or about 300 tons total pressure. The speed of the machine is 18 briquettes a minute. The machine is geared direct from a 75-hp. motor and is fully automatic. No labor is required, except one attendant to keep the lubricating facilities functioning.

Installation varies with local conditions. In some



PLAN and elevation of the plant for briquetting cast iron borings at the left and steel turnings at the right. The plant has a 5-ton overhead traveling crane with 36-in. magnet. Equipment is designated as follows: (A) Cast iron borings storage pit; (B) shield to prevent spillage; (C) overhead storage hopper; (D) briquetting machine for borings; (E) briquette conveyors; (F) briquette elevators; (G) transfer cars for briquettes; (H) briquette machine intensifiers; (J) turnings briquetting machine; (K) turnings screen conveyor; (L) washing machine for turnings; (M) storage pit for turnings; (N) feeding platform for turnings; (P) feeder for turnings; (Q) trap door to oil settling pit; (R) centrifugal pump for oil; (S) centrifugal pump for water.

plants the briquetting plant is located near the foundry, mostly under the charging platform. The borings are brought to the machine either by hopper-car or by conveyor, and the briquettes are elevated to the charging platform. In other plants the machine is placed in a central position with regard to the borings-producing departments. The borings are brought either by hand or conveyor to the machine, and the briquettes are taken to the foundry by either conveyor or gondola, or hand-carts, and are then lifted to the charging platform by an electro-magnet.

The briquetting plant proper consists of a structural steel storage hopper placed directly over the small feeding hopper of the machine. This storage hopper holds about 30 tons of borings. These borings flow continuously from the hopper into the machine. The resulting briquettes fall on to a conveyor and elevator, which removes them from the machine and deposits them into whatever conveying means may be provided for taking them into the foundry.

Actual savings derived from utilizing borings by this briquetting method depend on the value given to the briquettes by the foundry. And the opinions of foundrymen vary; some give the briquettes the full value of pig iron, others deduct 10 per cent from this value, to cover a theoretical loss during melting, and others again assign to them the prevailing price of heavy melting scrap.

A few words about the metallurgical considerations concerning briquettes. Fred J. Walls, chief metallurgist of the Wilson Foundry & Machine Co., submitted last year a paper on briquetting cast iron bornings, as the American Foundrymen's Association exchange paper for the Institute of British Foundrymen.

Summarizing briefly his observations and tests of melting briquettes in the cupola, this can be positively stated: When using as high as 21 per cent briquettes in the charge, no difference can be noted in the average chemical and physical properties of the produced metal, and no change in the percentage of good castings and scrap is observed. The machinability of the castings does not change, although the machine shop is fully aware of the castings having been made with briquette admixture. During the melting, no change of the melting rate nor in the temperature of the iron at the spout is observed. Positive evidence that the briquettes melt the same as any other scrap in the cupola has been obtained by the bottom drop at the end of a heat, where partly molten briquettes have been found, down to very small size.

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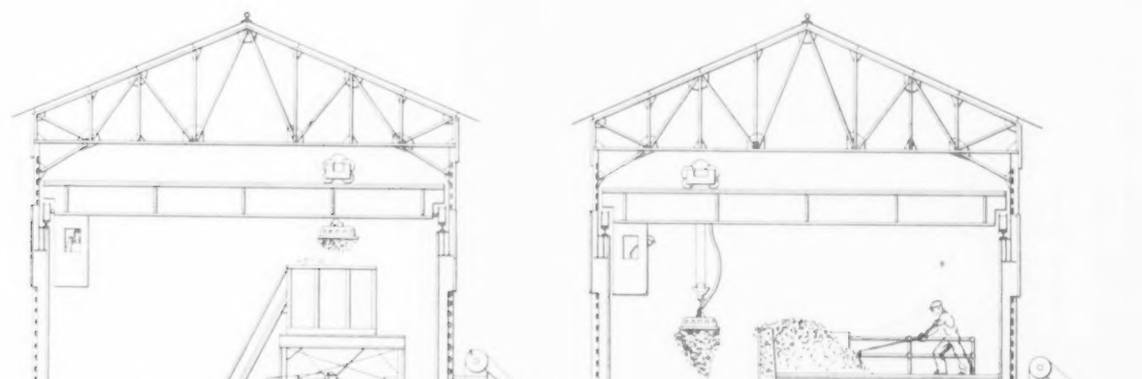
Synchronization of Control with Conveyor Equipment

(*Concluded from page* 1096)

matters of purchases, lists of materials, and issuing of materials on orders and into production are fully described. Part assemblies are never stored, but are synchronized on the feeder lines to the final assembly conveyor. This eliminates storage of some items. Here again the time element is paramount.

For all ranges the bottom of the crate is started first on the assembly conveyor. The proper parts are added successively at various stages along the way, until the range is complete and ready for final inspection. Then it is crated while still on the conveyor and passes to the warehouse, where it is stored under cranes serviced by conveyors.

Production control under these modern conditions has become a fine art. In no other branch of the industry is there greater need for resourcefulness and imagination. Once under way, production lines must be kept going. No price is too great to pay to accomplish this.



TRANSVERSE section through the two briquetting units. That at left is for cast iron borings while that at right is for steel turnings and shavings

THE ELECTRICAL INDUSTRY AS A CONSUMER OF METALS

By J. A. CAPP
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General Electric Co.
Schenectady, N. Y.

AT the first meeting sponsored by the District Committee of New York of the American Society for Testing Materials, on March 5, the author, a past-president of the society and for many years active in its work, discussed conductors, insulators and magnetic materials. The abstract of his address presented here substantially covers the portions of his paper dealing with metals.

In giving a picture of the electrical uses of metals, Mr. Capp stressed the improvement in alloys of high specific resistance for the heating of ovens and furnaces, the evolution of magnet steels and the perfection of silicon steel sheets, now so widely used in the electrical industry. The consumption of such sheets by one large user now runs from 25,000 tons to 40,000 tons a year.

WHILE the electrical industry uses practically every sort of material of commerce, there are three classes of material which may be said to be peculiar to the industry. They are

Conductors for carrying or consuming current.

Insulators for preventing or confining the flow of current.

Magnetic materials for applying or making easy the development of electrical energy.

The principal conducting material continues to be copper. Of the commonly commercial metals of reasonable price, copper has the lowest electrical resistance, is easily won from its ores in great purity and equally easily produced in the several forms required, such as wire, bars, sheets, strip and shapes. It was the metal first used and its reign has not seriously been challenged. Zinc and aluminum are used for special purposes, but the ratio of their consumption to that of copper is very small.

Alloys Used for Electrical Resistance

Ovens, furnaces and other heating devices are large consumers of current. Here the conductor must have properties practically the opposite of copper. The specific resistance must be high and the metal must be resistant to chemical or physical change at the temperatures developed in service. The development of the alloys of chromium with nickel and other common metals has made possible a large number of applications of electric energy to the heating of commercial ovens and furnaces, as well as household appliances, which would otherwise have been impractical or too costly. These alloys are available in several proportions of constituent metals yielding resistances from 50 to 65 times that of copper and with variations in other properties adapting them desirably to a variety of applications.

Many of the most useful characteristics of these alloys are not capable of accurate definition or of intrinsic measurement. For example, resistance to chemical or physical change at 900 deg. or 1000 deg. C. (1650 or 1830 deg. F.) may not be measured directly and quantitatively, but can only be determined relatively and expressed indirectly.

It is a general rule with metals that they have a characteristic electrical resistance and that, when pure, i.e., unalloyed with other metals, they have a relatively high temperature coefficient of resistance. Curiously, the coefficient of change of resistance with temperature of all the common metals of commercial purity is about the same—of the general order of 0.4 per cent per degree Centigrade. The alloying of two or more metals results in an increase of specific resistance to a value generally considerably higher than that of either metal and, at the same time, the temperature coefficient of resistance is greatly reduced. There are very useful alloys having a fairly high resistance and practically zero temperature coefficient over a range from, say, zero to 100 deg. C. Such alloys are invaluable for use in control resistances, meters and instruments.

It has frequently been said that two of the great needs of the electrical industry are:

1. A metal of low resistance, comparable with that of copper, but with a low temperature coefficient, approaching zero.
2. A metal of high resistance, comparable with that of nickel-chromium alloys, but with a high temperature coefficient, say equal to that of copper.

Of course such metals, which reverse the common behavior of alloys, must be capable of production in all the usual forms required for conductors and not be too expensive. While it must be admitted that the probability is very small, yet it would be a bold man who would deny the possibility that a combination of metals might be found which would possess at least an approximation to one or the other of these desirable combinations of resistance and temperature coefficient.

Two Classes of Magnetic Materials

The magnetic materials of the electrical industry fall into two general classes.

1. Those easily magnetized to considerable strength and having little power to retain magnetism.
2. Those less easily magnetized but capable of retaining a considerable proportion of the developed magnetic saturation.

The second class, generally referred to as "permanent magnet steels" or briefly but inaccurately simply as "magnet steels," are now generally alloy steels containing tungsten or chromium or both, and more recently quite large percentages of cobalt with tungsten or chromium. Originally, permanent magnets were made of carbon tool steel with about 1 per cent of carbon, water or brine quenched to glass hardness and with but little or no drawing of temper. Such magnets, while strong when first made, were found to "age" and gradually weaken. Then the addition of about 5 per cent or more of tungsten, with carbon at 0.50 to 0.80 per cent was found to make not only a stronger magnet, but the retention was greatly improved. This steel was used for many years, notwithstanding its tenderness and liability to breakage in hardening.

About 15 years ago, steel with 2 or more per cent of chromium and carbon up to 1 per cent generally began to replace the tungsten steel, having been found to give reasonably satisfactory results. It is less liable to breakage in hardening, since it is oil-hardening instead of requiring water quenching, and its retentivity is fairly comparable with that of the tungsten steel. Dr. J. A. Mathews has made an extensive study of permanent magnet steels and written many papers on the subject. The principal contribution of our society committees has been the standardization of methods of testing this type of steel for its magnetic characteristics.

Cobalt Magnet Steel

A comparatively new type of magnet steel is a cobalt steel containing, in a composition used abroad, about 15 per cent of cobalt with about 10 per cent chromium, or 30 to 40 per cent cobalt with 5-9 per cent tungsten as developed by Honda. These are oil-hardening steels, rather sensitive in heat treatment. Their cost is quite high compared with the tungsten or chrome steel, but their very high magnetic strength and permanence frequently warrant the cost. Taking the plain carbon as 1, the chrome steel would be rated at about 1¼ in strength and permanence, the tungsten steel at about 1½, while the cobalt chrome steel would rate 3½ and the Honda steel about 6.

Magnetic circuits include a variety of forms of iron, such as cast iron, cast steel, bar steels and forgings. For these, there are not usually very exacting requirements; in fact, other considerations are apt to dominate the selection and the magnetic characteristics are accepted as they come.

Sheets as Magnetic Materials

The major tonnage of magnetic materials is in the form of sheets used for building up the cores in armatures, and fields and in transformers. These sheets are generally from 0.014 to 0.025 in. in thickness, and, when the consumption of one large user runs from 25,000 to 40,000 tons a year, it is easily seen how large and important an item this sort of material is to the electrical industry. Realizing that the individual sheets weigh but a few pounds each, one can try to picture the enormous number of sheets required.

In the very early days of the industry, the only material available was the sheet steel used for the making of tin or terne plate or for general mechanical purposes. Much of it was used as received from the mill, generally in a cold-rolled finish to make the sheets flat. The advantages of annealing were early recognized and either mill annealed sheets were bought or the punchings themselves were annealed. So variable were the results that the early designers were sorely tried to maintain even the low standards of those days. Annealing was crude and controlled by eye or judgment, no pyrometer equipment being available.

When the late Dr. C. P. Steinmetz announced the law of hysteresis, and showed how the magnetic losses could be separated into two components, a great stride forward was taken by the electrical industry. But the road was still rocky and hard-going because the sheet makers knew little or nothing about electricity or magnetism and could not understand the language, and the electrical engineer found difficulty in translating it into terms that had any meaning to the steel maker and his technology.

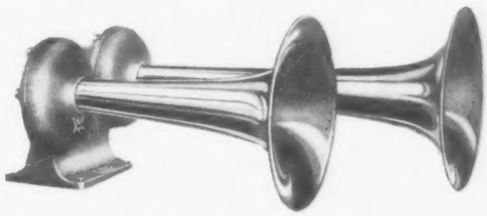
Then Morley and others discovered "aging," a term employed to indicate the increase in hysteresis with time and moderately raised temperature. This explained why many cores, initially satisfactory in core loss, gradually grew hotter in service with consequent lowering of efficiency. About this time the platinum type of thermocouple became available, at least for laboratory use, and intensive planned study of annealing conditions became possible.

It was found that by proper control of temperature and cooling rates, the commonly available sheet steels could be reduced in hysteresis to a reasonably low and stable value, but the maintenance of these conditions in a large production schedule

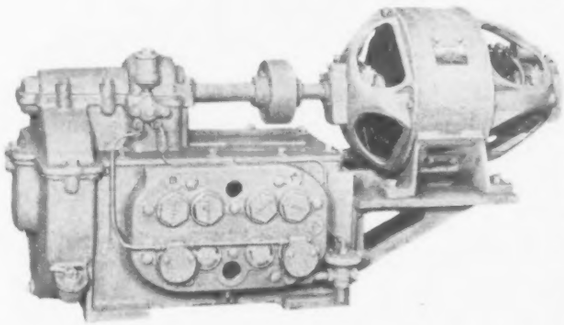
(*Concluded on page* 1122)

Pneuphonic Horn Signaling System in Beam Mill

AN air signaling system recently installed in the new beam mill of a Mid-Western steel plant includes a number of "pneuphonic horns," supplied by the Westinghouse Traction Brake Co., Wilmerding, Pa. This is said to have characteristics which make it particularly suited to steel mill application.



PNEUPHONIC horns of two tones, used in steel mill signaling and operated by compressed air.



MOTOR-DRIVEN air compressor supplying air to Pneuphonic horns used in steel mill signaling system. This operates automatically as pressure in the lines rises and falls.

Westinghouse - National air compressors are used to furnish air for the horns, apart from the general mill supply. The installation consists of a counterbalanced metal diaphragm inclosed in a sturdy weatherproof house, and a bronze bell. Air entering the housing and escaping through a restricted outlet causes the diaphragm to vibrate rapidly.

These vibrations release air waves that are greatly amplified by resonance in the bell, producing a pleasing sound of tremendous carrying power with very low air consumption. The deep tone signal is clearly audible at a great distance, but produces no ear-splitting annoyance nearby. It needs no adjustment and requires little attention. The horn is very responsive to blasts and may be sounded in quick succession if necessary.

Horns are located at the soaking pits, at the shears, in the motor rooms, at the rolls, saws, furnace room and elsewhere. The required wide variety of signal tones is accomplished by the use of several sizes of horns in single units and in pairs.

For example, a smaller horn is used first with a short bell, then with a long bell, and then the two are combined to give a chime effect. Also a larger horn of deeper tone is used with two different lengths of bell singly and then in pairs. Thus there are available several distinct alarms to signal for the various operations throughout the mill, as well as to summon the personnel, when necessary.

Air Supplied by Motor-Driven Compressors

For the 16 horns on this particular mill, air is supplied by two Westinghouse-National motor - driven compressors, located in one of the motor rooms. Just outside the motor room are the main reservoirs from which the supply line runs to the horns. Smaller reservoirs are placed at different points to supply additional air volume for operating the horns at the extreme ends of the signal system.

Most of the horns are remotely-controlled by means of magnet valves and push-button switches, but a few are operated directly by means of a whistle valve and signal cord.

Each air compressor is of the duplex horizontal-cylinder, single-stage, single-acting type, with water-cooled cylinder head, and is driven through efficient herringbone gear and pinion by a 250-volt d.c. motor. This compressor has an automatic lubricating system with but one place for oil refilling.

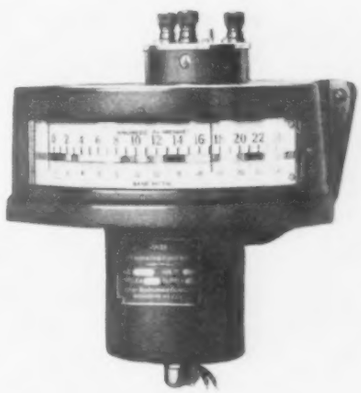
Inlet and discharge valves are of the latest flat washer type and a unique device is incorporated in the design to unload the compressor during the starting cycle. The compressors operate on the start-and-stop method of control, employing a multiple-step starter with a pilot governor that closes the circuit at low pressure and opens the circuit at high pressure.

With the two-compressor installation, as for example at the beam mill, the pilot governors are set in sequence so that one compressor will cut in at 95 lb. and continue to supply air alone unless the pressure falls below 90 lb., when the other compressor will cut in to assist the first. Both machines are cut out when the pressure reaches 110 lb. The governor settings are reversed occasionally, to equalize the work on the two compressors.

Other horns, with individual compressors of the type mentioned, are placed in two of the blooming and structural mills at the same plant. In the near future the plate and slab mill will be equipped with similar signals. At other points in the plant and yard "pneuphonic horns" are used as warning signals at mixers and converters and on the ore bridges.

Redesigns Indicating Pyrometer

THE Taylor Instrument Companies, Rochester, N. Y., have redesigned their indicating pyrometer control so as to embody some new features and several improvements. It has been found possible to decrease the weight of the original instrument by 3 lb. One of the results is said to be unusual quietness in operation. The back panel has been eliminated, which simplifies the wiring and makes the instrument easier to install or take down. The company points to its simplicity of design and the total absence of vibration or shock in the redesigned instrument as insuring dependability and long life.



Orders were placed in February for 516 steel boilers, with 622,343 sq. ft., against 598, with 576,723 sq. ft., in January, according to reports received by the Bureau of the Census from 74 manufacturers.

Pig Iron Production in 1930 Was Eleventh Largest

PRODUCTION of pig iron and ferroalloys in the United States in 1930 is reported by the American Iron and Steel Institute at 31,752,169 gross tons. This is the eleventh largest total reported for any year, but shows a reduction of 25.71 per cent from the 1929 total of 42,613,983 tons—the largest amount ever produced. The aggregate in 1930 included 31,020,907 tons of pig iron and 731,262 tons of ferroalloys.

In ferroalloys the year was the fourth largest, having been exceeded only by 1929, 1928 and 1918.

Of all pig iron and ferroalloys made last year 21,002,150 tons, or 66.1 per cent, was delivered molten. Except for 1929 and 1928, both of which showed between 70 and 71 per cent delivered in the molten condition, 1930 showed the highest such proportion which has ever been recorded.

PRODUCTION OF PIG IRON AND FERRO-ALLOYS BY STATES, 1926–1930.

States.	1926.	1927.	1928.	1929	1930.
Mass., N. Y., N. J.	2,729,261	2,775,351	2,562,715	3,025,282	2,211,434
Pennsylvania	13,587,881	11,829,599	12,422,602	14,453,251	10,304,886
Maryland	805,373	954,763	1,050,876	1,166,204	1,087,866
Virginia	103,000				
Alabama	2,953,294	2,782,993	2,546,009	2,709,881	2,394,725
West Va., Kentucky	516,094	699,514	864,922	864,201	864,824
Tennessee	110,146	133,785	110,837	138,753	
Ohio	9,359,275	8,502,459	9,098,739	9,795,648	6,804,862
Illinois	3,659,974	3,588,595	3,942,412	4,357,971	3,344,674
Indiana, Michigan	4,377,068	4,201,802	4,583,065	5,085,615	3,934,212
Wisconsin, Minnesota	537,499	455,727	339,267	379,162	804,686
Iowa, Colo., Utah	633,864	641,057	634,270	638,015	
Total...Gross tons	39,372,729	36,565,645	38,155,714	42,613,983	31,752,169
Pig iron	38,698,417	35,858,232	37,401,648	41,757,215	31,020,907
Ferro-alloys	674,312	707,413	754,066	856,768	731,262

PRODUCTION OF PIG IRON AND FERRO-ALLOYS BY STATES, 1929–1930, SHOWING INCREASE OR DECREASE BY STATES.

States.	Production—Gross tons.					
	1930.	Per cent.	1929.	Per cent.	Decrease.	Per cent.
Pig iron:						
Pennsylvania	9,967,618	32.13	14,016,015	33.57	4,048,397	28.88
Ohio	6,688,658	21.56	9,702,005	23.23	3,013,347	31.06
Indiana, Michigan	3,934,212	12.68	5,085,615	12.18	1,151,403	22.64
Illinois	3,344,631	10.78	4,357,905	10.44	1,013,274	23.25
Alabama	2,382,221	7.68	2,704,733	6.48	322,512	11.92
Mass., New York	2,008,812	6.48	2,804,698	6.72	795,886	28.38
Maryland, Virginia	1,074,184	3.46	1,124,762	2.69	50,578	4.50
West Va., Ky., Tenn.	848,130	2.74	980,214	2.34	132,084	13.48
Minn., Colo., Utah	772,441	2.49	981,268	2.35	208,827	21.28
Total pig iron	31,020,907	100.00	41,757,215	100.00	10,736,308	25.71
Ferro-alloys:						
Pennsylvania	337,268	46.12	437,236	51.03	99,968	22.86
New York, New Jersey	202,622	27.71	220,584	25.75	17,962	8.14
Ohio, Ill., Ia., Colo.	148,492	20.31	129,618	15.13	*18,874	*14.56
Md., Va., W. Va., Ala., Tenn.	42,880	5.86	69,330	8.09	26,450	38.16
Total ferro-alloys	731,262	100.00	856,768	100.00	125,506	14.65
Grand total	31,752,169	.....	42,613,983	.....	10,861,814	25.49
Pig iron	31,020,907	97.70	41,757,215	97.99	10,736,308	25.71
Ferro-alloys	731,262	2.30	856,768	2.01	125,506	14.65

*Increase.

PRODUCTION OF COLD, HOT, AND WARM BLAST CHARCOAL PIG IRON, GROSS TONS, 1926–1930.

Kinds of pig iron.	1926.	1927.	1928.	1929.	1930.
Cold blast	400	.....	.....	.....	.....
Hot and warm blast	163,480	164,569	142,960	138,193	96,580
Total.....Gross tons.	163,880	164,569	142,960	138,193	96,580

METHODS BY WHICH PIG IRON AND FERRO-ALLOYS WERE CAST OR DELIVERED IN 1930.

States.	Molten condition.	Sand cast.	Machine cast.	Chill cast.	Direct castings.	Total Gross tons.
Mass., N. Y., N. J., Maryland	1,701,094	129,707	1,353,622	12,881	322	3,197,626
Pennsylvania	7,801,812	120,287	2,111,012	268,658	3,117	10,304,886
Virginia, West Va., Ala., Ky., Tenn.	1,440,067	591,657	1,154,511	173,236	1,752	3,361,223
Ohio	4,495,728	12,895	2,285,165	.....	11,074	6,804,862
Ind., Ill., Mich., Minn., Ia., Colo., Utah	5,563,449	94,623	2,419,129	43	6,328	8,083,572
Total..Gross tons.	21,002,150	949,169	9,323,439	454,818	22,593	31,752,169

PRODUCTION OF PIG IRON BY GRADES AND FERRO-ALLOYS BY KINDS, 1929–1930, SHOWING INCREASE OR DECREASE.

Grades of pig iron and kinds of ferro-alloys.	1930.	Per cent.	1929.	Per cent.	Decrease.	Per cent.
Pig iron:						
Basic	18,393,384	59.29	24,911,654	59.66	6,518,270	26.17
Bessemer and low-phosphorus	7,314,749	23.58	9,877,240	23.65	2,562,491	25.94
Foundry	3,622,779	11.68	4,446,011	10.65	823,232	18.52
Malleable	1,571,512	5.07	2,312,813	5.54	741,301	32.05
Forge	50,696	.16	167,930	.40	117,234	69.81
All other pig iron	67,787	.22	41,567	.10	*26,220	*63.08
Total pig iron	31,020,907	100.00	41,757,215	100.00	10,736,308	25.71
Ferro-alloys:						
Ferro-manganese	362,386	49.56	476,655	55.63	114,269	23.97
Spiegeleisen						
Ferro-silicon	337,640	46.17	341,222	39.83	3,582	1.05
All other ferro-alloys	31,236	4.27	38,891	4.54	7,655	19.68
Total ferro-alloys	731,262	100.00	856,768	100.00	125,506	14.65
Grand total	31,752,169	.....	42,613,983	.....	10,861,814	25.49

*Increase.

PIG IRON MADE FOR SALE BY GRADES AND BY STATES IN 1930.

States.	Basic.	Bess. & low-phos.	Foundry.	Malleable.	Forge.	All other pig iron.	Total Gross tons.
Mass., N.Y., Md.	80,994	62,974	608,323	311,688	.....	24,074	1,088,053
Pennsylvania	483,542	189,312	321,107	73,036	32,726	.....	1,099,723
Va., W.Va., Ala., Tennessee	164,795	3,214	1,300,677	.....	5,009	1,992	1,475,687
Ohio	473,854	43,984	439,102	405,753	1,412	.....	1,364,105
Ind., Illinois	383,443	24,479	274,849	425,908	.....	14,585	1,123,264
Mich., Minn., Utah	10,846	.....	188,976	215,856	.....	909	416,587
Total pig iron	1,597,474	323,963	3,133,034	1,432,241	39,147	41,560	6,567,419

FERRO-ALLOYS MADE FOR SALE BY KINDS AND BY STATES IN 1930.

States.	Ferro-manganese and spiegeleisen.	Ferro-silicon.	All other ferro-alloys.	Total Gross tons.
New York, N. J., Penna.	135,442	189,507	14,712	339,661
Virginia, West Virginia, Tenn.	10,941	148,133	12,574	30,376
Alabama, Ohio, Iowa			3,907	145,179
Total ferro-alloys	146,383	337,640	31,193	515,216

HOW BASIC PIG IRON WAS CAST OR DELIVERED IN 1930.

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total Gross tons.
Massachusetts, New York	184,069	663,455	847,524
Pennsylvania	1,249,968	5,281,729	6,531,697
Maryland, West Virginia, Kentucky, Ala.	416,400	1,874,774	2,291,174
Ohio	1,029,034	2,452,065	3,481,099
Ind., Ill., Mich., Minn., Colo., Utah	917,085	4,324,805	5,241,890
Total.....Gross tons.	3,796,556	14,596,828	18,393,384

METHODS BY WHICH BESSEMER AND LOW-PHOSPHORUS PIG IRON WERE CAST OR DELIVERED IN 1930.

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total Gross tons.
New York, Maryland	72,765	414,191	486,956
Pennsylvania	393,057	2,516,949	2,910,006
West Virginia, Alabama	79,444	166,117	245,561
Ohio	349,903	1,918,012	2,267,915
Indiana, Illinois	195,058	1,209,253	1,404,311
Total.....Gross tons.	1,090,227	6,224,522	7,314,749

Plain Miller Adapted for Both Long and Short Run Work

CONCENTRATION of all controls at the front in a position convenient to the operator is a feature of the new plain milling machine, designated as the No. 22, brought out recently by the Brown & Sharpe Mfg. Co., Providence, R. I.

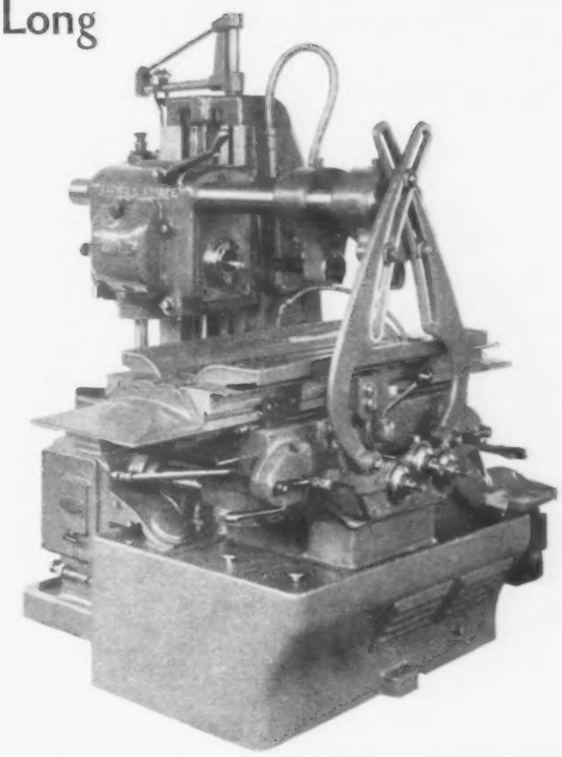
The machine is adapted for both short and long run production jobs. It has an automatic longitudinal feed of 22 in.; transverse saddle adjustment of 6 in. and a vertical adjustment of the spindle head of 13 in. These adjustments, as well as speed and feed changes, may be made by the operator without leaving his working position. A lever by which the spindle head is clamped rigidly in position also is within easy reach.

Automatic control for the table is provided by means of adjustable dogs on the front and several cycles of automatic operation are available with the dogs furnished. Power fast-travel and cutting feed for the table are available in both directions. Hand control, by a single directional control lever on the front of the saddle, is also provided.

The spindle is mounted on four anti-friction bearings and may be set for either right or left-hand rotation. It may also be caused to rotate continuously or to stop simultaneously with the engagement of the power fast-travel of the table and to start with the engagement of the cutting feed. When set for automatic operation, the directional control lever on the front of the saddle also controls the functioning of the spindle.

Other features include automatic lubrication by filtered oil for all units in the base and driving unit, a pressure greasing system for the end bearings of the table drive shaft, a single oiling station for saddle and table mechanism, wide chip space, and automatic control for cutter coolant with a quick return to the tank in base. Anti-friction bearings are used generally throughout the machine. Provision is made to adjust for wear in all cases.

The speed and feed change system is the same as that of the company's "Standard" milling machine. There is a single lever for each mechanism, one turn in either direction accomplishing a change in speed or feed. Sixteen spindle speeds, ranging from 25 to 620 r.p.m., and 16 feed changes, from 1 to 38½ in. per min., are obtainable. Direct-reading dials above the levers indicate the speed or feed for which the machine is set. Feed changes are made by a lever on the left of the saddle, speed changes by a lever on the right. Graduated dials of large diameter for the table, saddle and spindle-head movements promote speed and accuracy where frequent adjustment is required.



LONGITUDINAL feed, transverse saddle adjustment, vertical adjustment of spindle head, and speed and feed changes may be made from the operating position.

The machine is of the unit assembly type of construction. All gears and shafts are of heat treated alloy steel. Short splined driving shafts are used in the unit assemblies.

Extra equipment available includes a vertical milling attachment and a crane for transferring the attachment to the spindle-head. The machine is built with a pad on the back of the column to which the vertical milling attachment can be fastened when it is not in use. Another extra is a fixture flushing pump, used for flushing chips from the fixtures and the table. When the machine is running coolant is available at all times, its flow being controlled by a spring plunger in the nozzle.

Improved Rotary Geared Pump

CAP, stand and housing of heavier design are improved features of a new rotary geared pump brought out by the Brown & Sharpe Mfg. Co., Providence. This pump, designated as the No. 55 pump, is equipped with ball bearings and spiral gears, and replaces the No. 5 pump previously manufactured by this company. It is especially suitable for the hydraulic operation of machines.

Additional bolts increase the clamping effect and permit higher pressure service without danger of blowing the gaskets.

Enlargement of the suction port, including the pipe tap, permits freer intake of oil, and a discharge port of improved design is said to have operating characteristics which tend to reduce bearing loads, thus increasing the life of the pump.

Operating at speeds from 300 to 1200 r.p.m., the new pump delivers from 9 to 36 gal. per minute at zero pressure; at 1200 r.p.m., the capacity is 36 gal. per min. at 100 lb. pressure. Satisfactory efficiencies are obtained in both high and low pressure service.

Geometric Tool Co., New Haven, Conn., has appointed J. C. Ross & Co., 2207 First Avenue, South, Seattle, Wash., as exclusive selling agent in Washington and Oregon.

Heavy-Duty Press for Variety of Bottoming Work

THE Toledo Machine & Tool Co., Toledo, Ohio, has placed on the market a new series of heavy-duty presses for a variety of heavy bottoming work, such as restriking brake drums; also sizing fish plates and emergency brake levers, embossing, and both cold and hot forging.

The frames are of four-piece construction with heavy uprights, crown and forged steel tie rods. At the back of the frame, tie rods help to take the reaction of the blow and the knock-out bar near the center of the frame is described as still further increasing the rigidity.

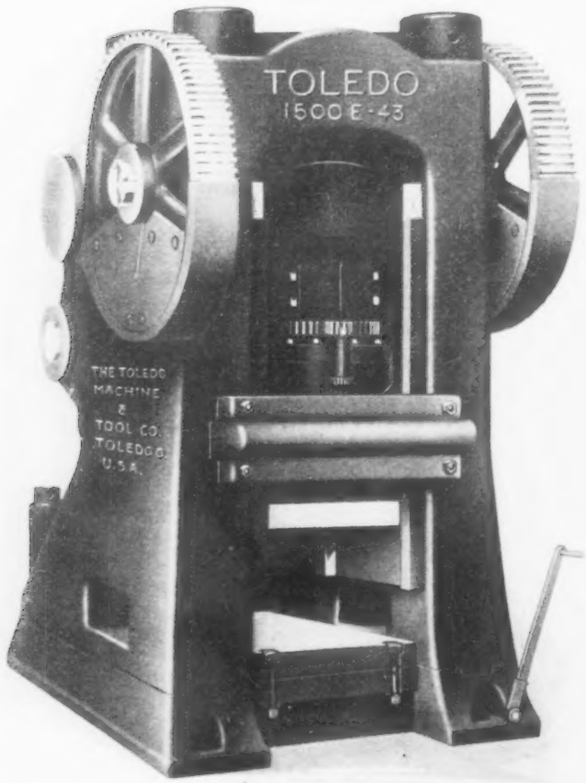
The bed area of the press illustrated measures 60 in. front to back, by 48 in., left to right. The distance from floor to top of bed is 18 in. and the top of the machine 14¼ ft. above the floor level. It is pointed out that this is low for a machine weighing approximately 250,000 lb. The bed of the press, however, extends below the floor level.

A heat-treated steel crankshaft of full-eccentric type provides a 12-in. stroke of the slide, which is capable of exerting a pressure of 1500 tons at the bottom. For more perfect balancing, twin gears are used. These gears are steel castings, have teeth cut from the solid, and are sufficiently large to take the full load of the press at any point of the stroke. A connection screw of heavy construction provides an adjustment of 3 in. which is made through a hole in the tie.

The slide is provided with long ways having a tie across the top; it has an area measuring 16 in. front to back by 30 in. left to right. The distance from the top of the bed to the slide, stroke down and adjustment up, is 24 in. The adjustable gibs are long and are said to be unusually heavy.

The drive shaft is mounted in roller bearings; elsewhere on the press bronze bearings are used. Lubrication is by a "watershed" system whereby oil is pumped to the bearings, the excess lubricant draining back to a reservoir. The gears run in an oil bath.

Power is furnished by a 50-hp., 1200-r.p.m. motor and the press operates at 30 strokes a minute. Control is through a multiple-disk friction clutch, integral with the flywheel and mounted on roller bearings. There is an independent brake by which the operator can stop or start the press at any part of the stroke. The design of the machine permits automatic feeding mechanisms of various types to be employed.



RESTRIKING brake drums, sizing fish plates and brake levers, embossing, and forging may be done on this new heavy-duty press.

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Broken Studs Removed Quickly by Screw Extractor

A LINE of screw extractors, for use in removing broken screws, studs, pipe fittings and similar screwed parts, has been placed on the market by the Greenfield Tap & Die Corpn., Greenfield, Mass.

No hammering is necessary to obtain a positive grip.

The design of this extractor, named the Little Giant, is shown in the illustration. An interrupted, left-hand thread feeds the tool into a hole drilled in the broken screw or stud. No hammering is necessary to obtain a positive grip, thus avoiding the danger of jamming the broken screw. The screw extractors are made of tool steel, heat treated to withstand torsional strain.

Thirteen sizes, ranging from 1/16 to 1 27/32 in. diameter at the small end, are made. They are made up in sets, contained in a wooden box to meet the requirements of garages, repair and machine shops. Some sets include drills of the proper size for each extractor. A special extractor is made for removing broken studs from the cylinder blocks of Ford cars without removing the cylinder head.

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Segmental Crucibles for Induction Furnaces

AFTER a year of development work in practical installations, the Babcock & Wilcox Co., New York, is marketing built-up crucibles made of refractory material for use in induction furnaces, for melting cast iron and special alloys. These crucibles are constructed of a number of tongued and grooved sections of tile, cemented together with B. & W. No. 80 cement.

When the crucible has been set into the furnace coil, the intermediate space between the coil and the crucible is packed with mica or asbestos

paper. The inside of the crucible has a rammed lining of the No. 80 crucible cement. By repairing or renewing the cement lining every 10 to 15 melts, it is possible to obtain 150 to 200 melts from one crucible.

Due to the construction described, and the use of the rammed lining, the crucible acts as a basket or a holder for the lining, but does not itself come in contact with the metal. The lack of shrinkage, low coefficient of expansion, and the intrinsic strength of the refractory material used make it particularly suitable for crucible construction.

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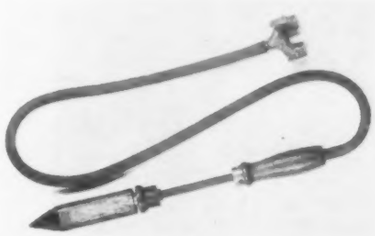
Soldering Iron Uses Natural or Artificial Gas

THE soldering iron illustrated is heated by natural or artificial gas, and low pressure air mixed by means of a needle valve and passing



through a ⅜-in. rubber hose to the handle of the torch. The copper tip may be brought to a red heat 3 to 5 min. after lighting and the temperature is adjusted as required by regulation of the needle valve. The tool has been placed on the market under the name "Torchiron" by the Reliance Specialties Mfg. Co., 122 East Forty-second Street, New York.

As the copper tips are not exposed to open flame, cleaning and retinning of the tip is seldom required. Coppers are available in sizes ranging from ½ to 5 lb. They may be quickly changed, being merely screwed on the stainless steel tip. The heat deflector is an integral part of the tool.

Low gas consumption is claimed; with the 3-lb. tip only 6 or 7 cu. ft. of gas an hour is required. Consumption is increased to 8 or 9 cu. ft. an hour when the 5-lb. tip is used. This soldering iron may be used as a torch as well as an iron.

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Shipments of industrial trucks and tractors in February totaled 56 units, against 38 in January, according to reports received by the Bureau of the Census from the 10 leading manufacturers.

Hobbing Machine for Cutting Multiple-Thread Long-Lead Worm Gears

A WORM gear hobbing machine especially adapted for cutting heavy pitch worm gears of multiple thread and long-lead type has been placed on the American market by the George Scherr Co., 142 Liberty Street, New York. This machine, built by J. E. Reinecker, Chemnitz, Germany, will cut spur, worm and spiral gears up to 90½ in. maximum diameter, 23½ in. face width and 2¾ in. circular pitch.

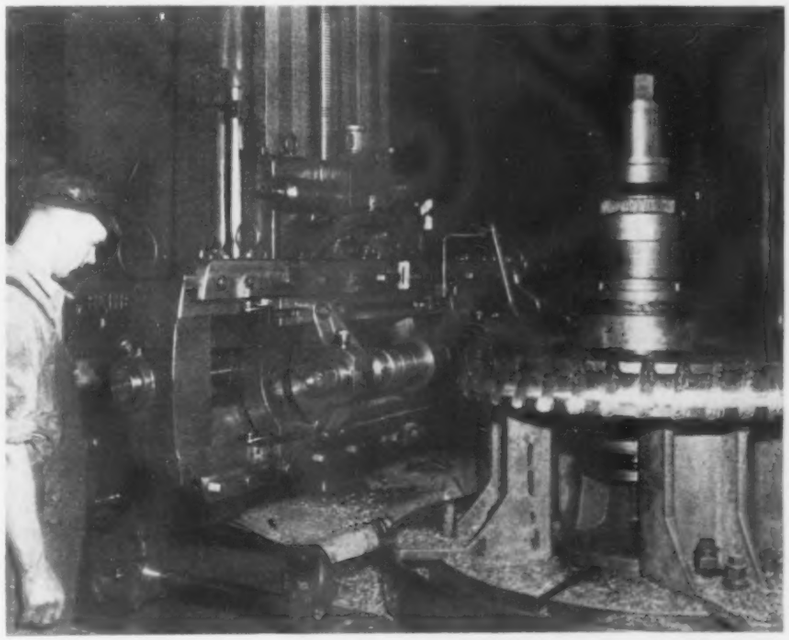
An important feature of the machine is that worm gears may be cut by the tangential feed method in which a short, preferably tapered, hob or a fly cutter is fed axially past the work. This method, it is stated, is necessary for cutting worm gears having a helix angle greater than 6 or 8 deg., since the radial or in-feed method of hobbing such worms tends to destroy the tooth flank, preventing full contact with the worm. The cutter head of the machine may be swivelled so that spiral gears up to 25 deg. angle, as well as worm gears with the axis inclined as much as 25 deg. to the wheel plane, may be produced. Provision is made on the Reinecker machine, however, for use of the in-feed hobbing method where that method is desirable.

Another advantage of the tangential feed method is that accurate gears may be cut with a simple and easily made fly cutter, a factor of special importance in repair or job work. The production time obtainable with fly cutters is said to be quite satisfactory, the machine permitting heavy cuts to be taken.

In cutting gear teeth by the tangential feed method, the gear blank and the cutter perform a combined rotary motion as is the case in the in-feed system. As the hob or cutter is fed in the direction of its axis into the blank in the tangential feed system, the ratio of rotation between blank and cutter must be changed slightly, however, from that determined by the relative number of teeth on worm and gear for the in-feed system of hobbing. This altered ratio is obtained by a differential change gear mechanism connecting the index gears with the feed. The index change gear, the feed gears and the differential gears are entirely independent, so that there is no necessity for difficult calculations.

The tangential feed is actuated by a quick-change feed gear box on the side of the machine. By means of three lever positions and two pick-off gears, 24 different feed changes from 0.006 to 0.327 in. can be instantly obtained.

The machine is driven by a 15-hp. motor, mounted above the gear box behind the upright. The gears provide 18 different cutter speeds ranging from 15 to 101 r.p.m. For rapid in or out traverse of the upright, rapid vertical movement of the cutter-head and return of the tangential feed slide, a separate 5-hp. motor is provided. Lubrication is automatic.



Worm gears may be cut by the tangential feed method employing either a short hob or a fly cutter.

Builds High-Speed 1000-Ton Flanging Press

THE 1000-ton hydraulic flanging press illustrated was designed and built by the Lake Erie Engineering Corpn., Buffalo, for a large plate-working shop. Intended for general flanging and dishing operations, the press is designed to provide the adjustability and clearance required during the bending and forming processes of this class of work.

There is a central main ram, 28 in. in diameter, two 16-in. diameter side rams, one 16-in. central clamping ram, and one 16 x 14 in. double-acting ram. This double-acting ram is mounted in the top platen and has an off-center adjustment of 18 in. Other equipment includes four 8-in. clamping rams which may be adjusted in and out from the center to accommodate heats of any diameter up to the maximum capacity. These rams, which operate through slots in the moving platen, facilitate deep-drawing in one operation. In this work, all wrinkles are smoothed out by a clamping ring.

For rapid movement of the platen up to the work, there are four 7-in. jack rams which operate at a speed of approximately 60 ft. per min. During this stroke the main cylinders are prefilled from a slack-water filling tank.

Adjustment for pressures of 330, 660 or 1000 tons is obtained by setting the lever of a distributing valve. The control valves, of forged steel, are equipped with stainless steel stems and monel metal sleeves.

Clearance between tie-rods is 12½ ft. The platens measure 16 x 12 ft. Between the platens there is a "daylight" clearance of 6 ft., minimum, to 12½ ft., maximum. The total height of the machine is 32 ft., of which 17 ft. is above the floor level. Approximate floor space required is 12 x 18 ft. The total weight of the press is approximately 180 tons.

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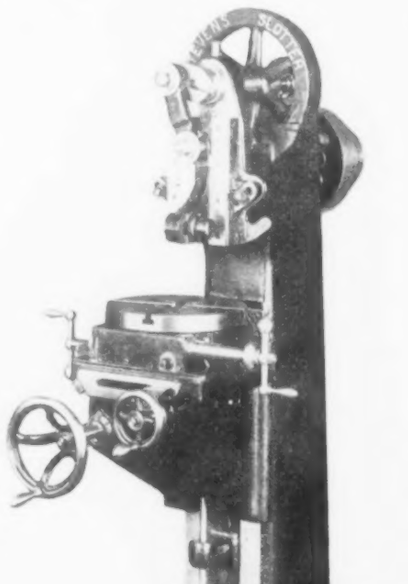
Slotter for Toolroom or Production Work

FOR both toolroom and manufacturing purposes, a new vertical slotter has been brought out by John B. Stevens, Inc., 304 Hudson Street, New York. The stroke is adjustable from 0 to 4 in., and the ram slide can be swiveled 5 deg. on either side of center and set to a scale reading in degrees. The machine is adapted for die work, key seating, both straight and taper, internal and external gear pattern cutting where draft is required, and all vertical slotting within its range.

The longitudinal and cross motions of the rotary table provide for work of any outline. A dial graduated in minutes is provided for the rotary table worm shaft. For small divisions and rapid work the table can be revolved by hand, using the locking pin which provides 12 accurate divisions, including divisions for squares, hexagons and octagons. Micrometer dials are used on screws for longitudinal, cross and knee movements. A choice of two positions for binding cutting tools is provided. The tool shank diameter is 15/16 in. Three different ram speeds are obtainable.



The diameter of the table is 12 in.; distance from column face to tool center, 9¼ in.; floor space required, 28 x 44 in. The machine weighs 1150 lb.

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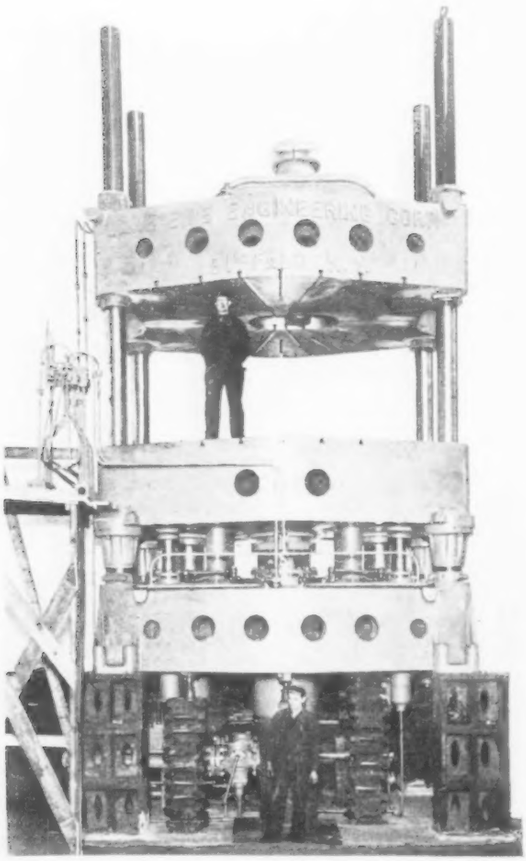
Installs New Mill for Rustless Strip Steel

Supplementing its facilities for producing rustless steel wire and rod, the Alloy Metal Wire Co., Inc., Moore, Pa., has installed a new United four-high rolling mill for the production of cold-rolled strip in widths up to 16 in. and thicknesses from ⅛ in. to 0.003 in. With this new equipment the company will be able to produce rustless steel strip, wire and rod within close precision limits.



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DIE work, keyseating, and gear pattern cutting where draft is required are within the range of the vertical slotter shown at right.

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THE press at left is for general flanging and dishing operations. Clear distance between tie rods is 12½ ft.; the maximum daylight is 12½ ft. and the minimum, 6 ft.

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WHEN MONEY IS CHEAP

GOOD business to revamp plants and equipment in dull times. Bethlehem Steel Corpn. thinks so, according to its annual report released last week. It spent $47,000,000 for plant improvements in 1930, as compared with $22,000,000 in 1929.

TAKE YOUR CHOICE

"COLLAPSE in prices of staple commodities not due to overproduction," says Viscount D'Abernon, financier and British Ambassador at Berlin from 1920 to 1926. "There has been no startling increase in wheat production, and the output of copper, silver and cotton had fallen heavily before the slump. It is not so much commodities which have fallen, but the value of gold has gone up." Hence underconsumption.

But C. W. Steffler, in "Trade Winds," published by Union Trust Co., Cleveland, discussing the reasons for the failure of schemes and cartels for the control of commodity prices, puts "rigid production control" at the base of any plan to secure stabilization. It is overproduction, according to Mr. Steffler, and failure to regulate surpluses which cause prices to tumble.

Who or what pushed Humpty Dumpty off the wall is not as important just now as putting him together again.

"HUNCHES" AID RESEARCH

RESEARCH men will be interested in the answers of 200 scientists to a questionnaire sent them by Prof. R. A. Baker on the subject of "hunches." These were tabulated and presented to the American Chemical Society for its current meeting. Credit is given to the "hunch," or quick "flash of genius" for the solution of many difficult scientific problems. And what is more important, is that we are told how many of these investigators set a trap and bait it so that the hunch will walk in.

Fifty-three per cent of those answering said that they used devices to create conditions favorable to the "hunch."

The expedients named were mentioned in the following proportion, taking as 100 per cent the number of those answering each question in the affirmative. By temporarily abandoning the problem and taking up other work, 60 per cent; by a period of idleness and complete relaxation not spent in attacking any other problem, 45 per cent; by going over the problem just before retiring for the night, 47 per cent; by physical occupation or exercise, 15 per cent; coffee, 42 per cent; tobacco, 14 per cent; alcohol, 3½ per cent.

All agree however, that there must be a long period of investigation of data and a period of assimilation of the facts before the hunch can be expected to show up. So there's some work to it after all.

INVESTIGATING IS POPULAR

SOME people are particular as to how other people make their money. Senator Couzens, of Michigan, whose original investment of a few thousands in Ford Motor returned him many millions, is said to have suggested the inquiry now begun by the Department of Justice concerning the $43 rail price. He "smells" collusion. But independent action in announcing prices is no violation of the law, according to the recent decision in the Bolt, Nut and Rivet case. And one may still play "follow leader" without going to jail.

COMPARE WITH 1928

REPORT of the American Iron and Steel Institute shows 1930 pig iron production 25 per cent below 1929. Compared with 1928, however, the deficit was approximately 17 per cent. The latter year is a better one for such comparisons than the abnormally "prosperous" 1929.

BIDDING FOR FREIGHT BUSINESS

COMPETITION in the moving of raw and finished products is as keen as that in the making and selling of them. Ask the railroads. Motor trucks are taking a fat slice of the annual billion dollar transportation business and ships and barges are after still more of it. The trucks compete on the short hauls and the water carriers on the long.

Ford, within 60 days, will have two more ships in his already extensive fleet. These will be 300 ft., all steel, turbine-driven cargo carriers, the largest on the Lakes.

Jones & Laughlin, first company to inaugurate extensive river shipments of steel, has purchased the plant of the Lukens Steel Co. at New Orleans. More water shipments coming. Already this company ships by barge from Pittsburgh and elsewhere to a distance of 2000 miles via river. The intracoastal canal completion will soon extend its water shipments to Texas points.

Trucks are gnawing away at railroad business on the short haul. Hartford shippers estimate one-third of the freight produced in their district to be hauled to destination by trucks.

But the railroads are preparing to fight back. Hearings will be held in Pittsburgh this week before representatives of rail carriers and shippers in the Central Freight As-

sociation district to consider a sharp reduction in short-haul freight rates on iron and steel products.

It's an ill wind that blows nobody good. Shippers and consumers may benefit by the carriers' competition.

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TEN COMMANDMENTS

FEDERAL Trade Commission, after studying trade practices of some 80 business groups, has just issued 10 rules defining unfair practice. These apply specifically to the luggage industry but may be taken as defining the commission's attitude with regard to "don'ts" for all business. In a nutshell, here's what is considered taboo:

1. Secret payment or allowance of rebates; 2. Price discrimination in restraint of trade; 3. Inducing breach of contract between competitor and customer by false or deceptive means; 4. Selling below cost to injure competitor or in restraint of trade; 5. Offering or presenting money or presents to customers' or prospects' representatives or employees without the knowledge of their employers or principals; 6. Defamation of competitors by false statement or imputation; 7. Malicious enticement of competitors' employees; 8. Shipment or delivery of products not conforming to samples; 9. False or misleading advertising; 10. Shipping on consignment with the intent and effect of injuring competitors.

Rule 2, with regard to pricing, is modified by the following clause:

"Provided that nothing herein contained shall prevent discrimination in price between purchasers of the same class on account of differences in the grade, quality or quantity of the commodity sold, or that makes only due allowance for differences in the cost of selling or transportation, or discrimination in price in the same or different communities made in good faith to meet competition; and provided further, that nothing herein contained shall prevent persons engaged in selling the products of this industry in commerce from selecting their own customers in bona fide transactions and not in restraint of trade."

The Federal Trade Commission will shortly issue a further codification of ethics for business practice in addition to these preliminary definitions of what is unfair. Pretty soon we shall all know how to behave!

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BIG FISH IN FRYING PAN

HERE are some of the larger items of forthcoming industrial construction that are revealed in the week's list of projects which require machinery and equipment in their completion. It takes an ante of half a million dollars to get into this class.

Crowell Publishing Co., Springfield, Ohio, will install conveying, power and mechanical equipment to the tune of $500,000.

Atlantic Refining Co., Philadelphia, will spend a half million for expansion of bulk storage and distributing plants in western New York.

Boston Board of Education chips in $700,000 for manual training shops in a new school at Jamaica Plain.

Department of Public Buildings, Washington, plans central heating plant that will cost $500,000.

Board of Education, Annapolis, Md., will spend half a million dollars for manual training equipment and new high schools.

Virginia Public Service Co., Charlottesville, Va., will spend $2,786,000 this year for new construction.

New York Edison Co. will extend and improve facilities at East River plant, New York, with an expenditure of $5,520,000.

United Electric Light & Power Co., New York, will spend $6,329,000 at Hell Gate electric generating station.

City Commission, Amarillo, Tex., has arranged fund of $1,000,000 for installing natural gas distribution system.

Republic Oil & Refining Co., Houston, Tex., will build new refinery and distribution plant at Texas City, involving $1,000,000.

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SHOELEATHER DOES IT

GRAY IRON INSTITUTE reports 6 per cent increase in production in February and corresponding gain in orders. First in eight months. Greatest gains were made by small foundries with capacities of less than 100 tons per month. Little fellows are evidently doing lively footwork chasing new business.

World Coal Conference in Pittsburgh Nov. 16-21

The third international conference on bituminous coal, sponsored by the Carnegie Institute of Technology, will be held at Pittsburgh on Nov. 16 to 21. The purpose of the congress is to present for discussion the results of recent studies of coal, emphasizing improved methods of utilization and their economic value. The program will include papers on carbonization, liquefication and gasification of coal; by-products; the mechanism of combustion; cleaning of coal and its preparation for the market; pulverized fuel; power plants; domestic heating, etc.

An invitation has been extended to scientists of all countries to take part in the conference. Dr. Thomas S. Baker, president of the Carnegie Institute of Technology, has recently returned from Europe, where he conferred with many of the leading fuel technologists. Thomas R. Alexander is secretary of the conference.

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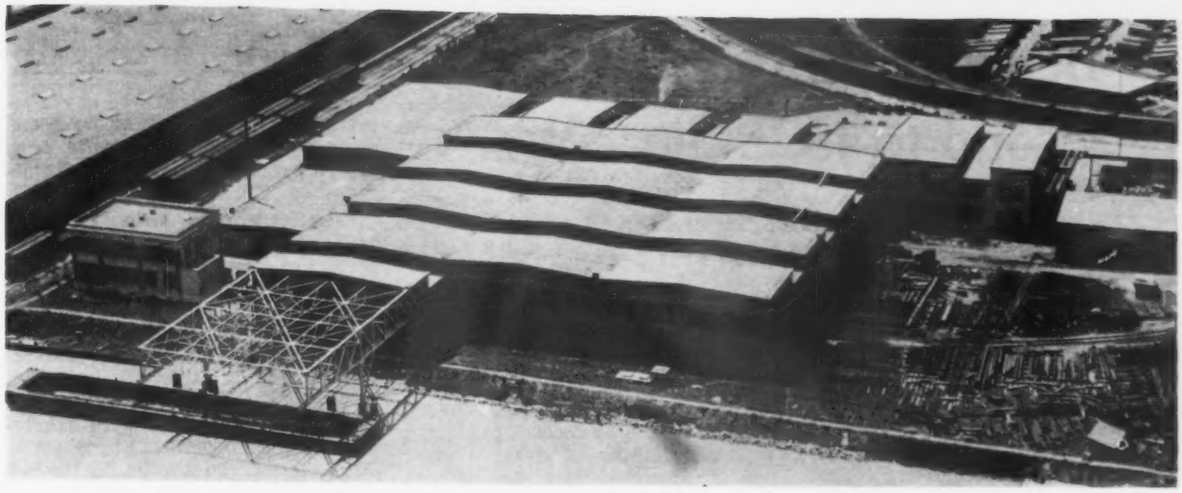
Fabricated Steel Orders Lower in February

WASHINGTON, March 31.—Bookings of fabricated structural steel in February aggregated 166,800 tons, or 41.7 per cent of capacity, according to estimates of the Bureau of the Census. Estimates for January were 172,000 tons, or 43 per cent of capacity. Orders actually reported to the bureau were 138,394 tons and 142,401 tons respectively.

Steel Barrel Output Rose in February

WASHINGTON, March 31.—Increasing by 28,320, the production of steel barrels in February rose to 450,134 units from 421,814 in January, according to reports received by the Bureau of the Census from 27 companies. The respective rates of operation were 33.1 and 32.6 per cent of capacity.

Unfilled orders for delivery within 30 days at the end of February increased to 231,738 barrels from 210,416 at the end of January. Unfilled orders for delivery beyond 30 days were 1,160,354 and 1,214,029 respectively. Stocks at the end of February were 63,244, compared with 62,595 at the end of January. February shipments were 449,485 barrels, against 427,622 in January.



Jones & Laughlin Buys New Orleans Warehouse

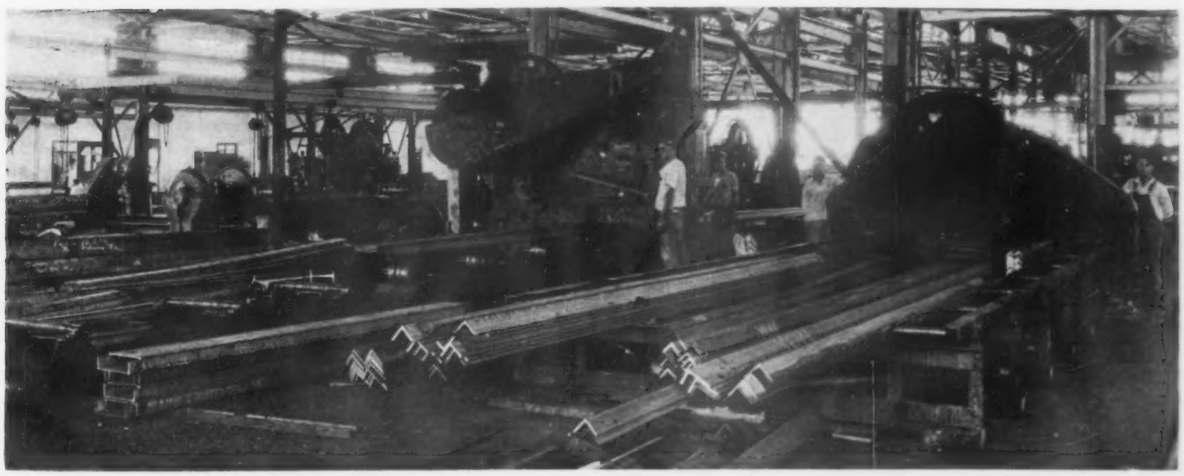
THE Jones & Laughlin Steel Corpn., Pittsburgh, has purchased the plant of the Lukens Steel Co. at New Orleans, La. This acquisition will give the former company a large modern steel fabricating, warehousing and distributing base at the mouth of the Mississippi River which can be served directly by river transportation as well as by rail. The plant will be taken over at once.

The Lukens warehouse and fabricating shop are on a 17-acre site on the turning basin of the New Orleans Industrial Canal, about one mile from the Mississippi and six miles from the center of the city. The buildings consist of a four-bay steel warehouse, a fabricating shop and a two-story office building. The warehouses and shops are fully equipped with traveling cranes, punches, shears and other machinery and tools and occupy an area in excess of 100,000 sq. ft. Buildings and equipment are in first-class operating condition. The plant has complete rail and water facilities, enabling the interchange of steel products between river barges and the plant, the railroads or ocean-going vessels. The unit will be utilized for warehousing merchant bars, structural material, plates, concrete bars, cold-finished steel bars, special shapes, junior beams, steel pipe, wire products and other finished steel lines, which will be distributed locally in New Orleans and by rail and water transport to customers in the South and Southwest or on the Pacific Coast and in foreign countries.

The Jones & Laughlin company was the first steel company to inaugurate extensive river shipments of steel products in order to reach distant markets and has been shipping in this manner to New Orleans and other Southern points for 10 years. The Lukens plant is an addition to established warehouses at Pittsburgh, Cincinnati and Memphis, Tenn. These warehouses distribute products locally as well as by rail to various parts of the country, and in some cases steel products have been transported 1000 to 2000 miles by river and then another 1000 miles by rail. The company has shipped steel by barge as far as Minneapolis in the Northwest and Biloxi, Miss., in the South. Regular river service has been maintained at intermediate points on the Ohio and Mississippi. With the completion of the intracoastal canal between New Orleans and Corpus Christi, Tex., the service will be extended to Port Arthur, Beaumont, Galveston, Houston and other Texas cities by all-water delivery from Pittsburgh or from warehouse in Memphis and New Orleans.

Jones & Laughlin's new steel warehouse and rail-water terminal at New Orleans, shown above. Steel products from the mills in Pittsburgh will be shipped to this distributing depot in 1000-ton steel barges via the Ohio and Mississippi rivers, a distance by water of 2000 miles.

Below is a view of the fabricating shop of the Jones & Laughlin warehouse in New Orleans.



Bethlehem's 1930 Results Second to 1929 Since War

Annual Report Discloses Bonus Payments to Officers of $1,983,856 Last Year

NOTWITHSTANDING the generally unsatisfactory conditions in the steel trade during most of 1930, the Bethlehem Steel Corpn.'s earnings available for dividends last year were the largest since the war, excepting 1929. This point is emphasized in the corporation's pamphlet report for the year. The total income before interest and depreciation charges was the largest for any year since the war, excepting 1926 and 1929.

Net income for the year was $23,843,406, compared with $42,242,980 in 1929. Last year's profits were equivalent to $5.26 per share of common stock against $15.50 in 1929 on 2,273,333, the average number outstanding during that year.

"The 1930 earnings were made in the face of the adverse general industrial situation, both as to production and selling prices," the company's report states. "Operations of the steel plants for the year averaged 61.7 per cent of capacity as compared with 91.8 per cent in 1929. During the first half of the year a satisfactory rate of operations was maintained, but during the second half the demand for practically all steel products steadily declined until in December the rate of operations was only 31.3 per cent of capacity, the lowest rate at which the steel plants have operated since July, 1924. The reduction in operations was accompanied by a substantial decrease in selling prices throughout the year."

$47,158,004 Expended for Additions and Improvements

During 1930 Bethlehem expended $47,158,004 for additions and improvements, and at the end of the year the uncompleted work on construction authorized and started in 1930 involved a further expenditure of $14,820,000. The most important construction projects in progress are additional open-hearth capacity at the Sparrows Point, Md., and Lackawanna, N. Y., plants. A 40-in. slabbing mill is also being installed at the Maryland plant, and the 152-in. plate mill at the Coatesville, Pa., plant is being removed to Sparrows Point, where its size will be increased to 160 in. A new 166-in. sheared plate mill had been planned for construction at Sparrows Point, but as the business situation brought about the permanent closing down of the plate department, together with blast furnaces and open-hearth furnaces at Coatesville, it was decided to move the large plate mill from that place to the Maryland plant. Other improvements under way include the rebuilding of the by-product coke oven equipment at the Lackawanna plant and the complete rebuilding of two blast furnaces, one at the Maryland plant and one at the Lackawanna plant, together with the installation of primary gas washers and equipment for cleaning and distributing blast furnace gas.

Part-Time Employment Adopted to Ease Depression Conditions

"Policies of orderly readjustment to economic conditions have been followed during the year," says the report, "with, however, a view toward the long-range industrial outlook. To avoid widespread unemployment among the employees, in consequence of reduced operations, a system of part time employment was adopted throughout the entire organization, thus distributing the available work as equitably as possible and preserving practically intact the regular payroll force. This policy has stabilized the employment situation, without disturbing the wage scale or impairing the satisfactory labor relations which have been developed over a period of years. The total payroll for the year was $108,301,185, as compared with $124,958,674 in 1929. Average earnings per hour (exclusive of general administrative and selling force) were 66.6c. in 1930, compared with 65.4c. in 1929.

"At the end of the year 12,815 employees were the holders of record of 105,254 shares of preferred stock of the corporation purchased and paid for under the employees' saving and stock ownership plan, and 17,526 employees were paying in installments for an additional 47,968 shares.

"At the end of the year officers and employees of the corporation and its subsidiaries were the holders of record of 219,790 shares of its common stock purchased under the management stock ownership plan, for which they had paid in installments on account of the purchase price $1,925,297, exclusive of dividend credits.

"The total amount paid under the bonus system for the year 1930 to officers and heads of departments having control of matters affecting the corporation as a whole was $1,983,856.

"During the year the corporation assisted 280 employees to buy homes having a total cost of $1,483,882. Under the plan referred to in the report for 1927 a total of 5412 employees have, with assistance from the corporation, bought their homes for prices aggregating $22,626,922.

"The corporation during 1930 paid $591,746 in pensions to retired employees as compared with $548,971 for the previous year. Of the amount paid during 1930 the sum of $188,405 was paid out of a pension trust fund established in 1928 and the balance was charged to other reserves made in years prior to 1930. During the year 222 new pensions were granted and 112 were terminated by death or other causes. To provide for the new pensions $789,769 was paid into the pension trust fund during 1930 and charged against current earnings. At the end of the year there were 1215 retired employees on the pension list.

"During the year $1,009,294 was paid to sick or disabled employees or to the dependents of deceased employees under the relief plan described in the report for 1926 out of contributions by the participating employees made in the form of payroll deductions.

"The number of stockholders at the end of the year was 83,160, of whom 3005 held both preferred and common stock. The number of holders of the preferred stock was 34,770 and of the common stock was 51,395."

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Group Meeting of Steel Treaters in Philadelphia

Plans are being completed for the third annual Eastern chapters group meeting of the American Society for Steel Treating to be held on Friday, May 15. The Lehigh Valley, New Jersey, New York, Philadelphia and York chapters will participate in an all-day meeting in Philadelphia. Registration at 10 a. m. at the Penn Athletic Club, Eighteenth and Locust Streets, will be followed by a technical session at the club. Luncheon will be furnished by the Philadelphia Electric Co. After luncheon, the gathering will be the guests of the Philadelphia Navy Yard. The Naval aircraft factory will also be a feature of this trip.

The national officers of the society will be present at a dinner which will conclude the day's session.

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"Blast Furnace Slag as Concrete Aggregate" is the title of a 46-page pamphlet issued by the National Slag Association, Cleveland. It is the report of the committee 201 on aggregate specifications for the American Concrete Institute.

Department of Justice Is Investigating Rail Price

Quotation of $43, in Effect Since 1922, Subject of Federal Inquiry Requested by Interstate Commerce Commission

By L. W. MOFFETT

WASHINGTON, March 31.—Official announcement made last Thursday by Attorney General Mitchell that the Department of Justice has begun an investigation under the Sherman anti-trust law regarding the uniform price of $43 for steel rails followed reports of the past few weeks that such an inquiry was being made or was in contemplation.

The Department of Justice was asked by the Interstate Commerce Commission, through Commissioner Eastman, to make the investigation after the commission received a letter from Senator Couzens of Michigan, who is said to have suggested that an inquiry be made.

The Michigan Senator originally introduced the subject on Dec. 31 in a statement he made as chairman of the Senate Committee on Interstate Commerce attacking President Hoover for approving the railroad consolidation plan. The Senator vigorously opposed the plan and among other things charged that it would not bring about economies which President Hoover said would result from consolidations.

"Whether or not the economies outlined by the President will materialize is questionable, but there do appear to be other economies not brought around by consolidation that might be practised by the railroads," the Senator said. "For example, during the last 10 years there has been no reduction in the price of rail by the steel companies to the railroads. I am informed that they have been paying $43 per ton for steel rail during all of this period, while other steel products have been reduced on the average of 20 per cent. I am informed that approximately $90,000,000 have been spent by the railroads for steel rail, and had that been reduced the same percentage as other steel products the saving of the railroads would have been $18,000,000. The fact that all companies seem to have been charging the railroads $43 per ton would make it appear that there must have been some collusion between the railroads and the steel companies."

Rail Price in Effect Since 1922

The existing price of $43 for steel rails was established on Oct. 1, 1922, so that it has been in effect a little less than eight and a half years, rather than 10 years, as the Senator said. He did not make clear what period he had in mind in speaking of the $90,000,000 expenditure for rails. Manifestly, it was many times greater than that since the existing price has prevailed. Last year, though the rail output is estimated at a little under 1,900,000 tons, capital expenditures by Class 1 railroad for heavy rail were $47,101,000, according to the American Railway Association, and had there been a 20 per cent price reduction the so-called saving to the railroads would have been $9,420,200. However, if the Senator was referring to such a reduction since the present price went into effect, obviously he left out of consideration the important fact that during that period the prices of other steel products have fluctuated, increasing as well as decreasing. Naturally, the rail price would not take a 20 per cent reduction in such a period, but would have also been subject to advances as well as possible declines, so that the total paid for rails would have been greater at times under such market conditions than that actually expended.

Rails Below Average Steel Price

It is also a fact that, figured on an equivalent basis, the present composite price of finished steel is 2.128c. a lb., while the rail price is only 1.919c. a lb., rails being sold by the gross ton while other rolled finished steel is sold by the net ton. Furthermore, rails are always sold on a mill f.o.b. basis, and not on varying bases as are other finished products.

The uniformity of rail prices, as is well known, grew out of agreement between rail makers and railroads, and first was established at $28 for Bessemer rails on May 1, 1901, for a 15-year period, with a differential for open-hearth rails, which now take a $43 price. The railroads and steel companies have done much in the way of research work for improving the quality of rails ever since the price structure was agreed upon. It is difficult, under these circumstances, to understand the "collusion" of the steel companies and railroads and a possible violation of the anti-trust law.

The statement issued by the Senator was being prepared while he was in conference with President Daniel Willard of the Baltimore & Ohio, who apparently knew nothing of its contents at the time. The conference related to the consolidation plan.

Steel Prices Previously Attacked

The Senator's attack on the steel companies was preceded by some three weeks by a tirade in the Senate, led by Senator Norris of Nebraska, attacking the steel companies for announcing an increase of $1 a ton in the price of plates, shapes and bars. After one company had announced the increase others followed, as has long been the practice. Senator Norris affected to see "collusion" in this instance. The Department of Justice, however, apparently answered the Senator in the Bolt, Nut and Rivet Association decree. The decree made it clear that independent action on prices is no violation of law.

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Gray Iron Production Up 6 Per Cent in February

An increase of 6 per cent in production in the gray iron industry during February as compared with the previous month is shown in the monthly trade report of the Gray Iron Institute, Cleveland. The February report is the first in eight months in which an increase is shown in all three of the important items of production, new business and unfilled orders. By districts the Middle West, including Illinois and Wisconsin and all territory west of the Mississippi River and the Chicago district, showed a sharp gain in production. In the Central district there was a slight decline.

February production in all districts, 162 foundries reporting, was 55.3 per cent of normal, compared with 52.1 per cent in January. New business as shown by 80 reports was 52.2 per cent of normal in February, against 51.4 per cent in January. Unfilled orders were 38.8 per cent, against 34 per cent during the previous month. Two foundries reported the business outlook good, 52 as fair, 57 as poor and 22 as bad.

Production in the Eastern district, including New England, New York, and New Jersey, was 51.9 per cent of normal in February, against 49.3 per cent in January. The Central district, including Pennsylvania, Michigan, Ohio, Indiana and the South to the Mississippi River, produced at 55.4 per cent of normal last month, against 57.8 per cent in January. Wisconsin, Illinois and the territory west of the Mississippi River showed a production of 57.9 per cent, against 47.5 per cent in January. The Chicago district increased to 50.9 per cent from 38.3 per cent in February. The greatest gain in production was by small foundries up to 100-ton capacity. Others showed an increase except those ranging in capacity from 100 to 250 tons a month.

Short-Haul Freight Rates May Be Generally Lowered

Hearing This Week at Pittsburgh May Result in Reductions There and Elsewhere

WASHINGTON, March 31.—Hearings will be held on Thursday of the present week in the William Penn Hotel, Pittsburgh, before representatives of the Trunk Line Association and the Central Freight Association on the proposal of the latter to reestablish short-haul rates on iron and steel products in Central Freight Association territory.

It is the plan of the carriers to set up a scale for distances not in excess of 100 miles, beginning with a rate of 3c. a 100 lb., and attaining a maximum of 16c. for 100 miles and over 95 miles. For the latter distance, the rate would be the same as that carried in the basic scale of the so-called general iron and steel rate (Hoch-Smith) case fixed for Official Classification territory. For the shorter hauls, however, the proposed rates would be considerably under the Hoch-Smith scale, which begins with a rate of 6c. a 100 lb. Reduction in short haul rates in Trunk Line and Illinois Freight territories also appears to be probable.

The action of the Central Freight Association carriers in proposing the short-haul scale apparently resulted from action of the Public Service Commission of Pennsylvania, which held that iron and steel rates prescribed were unreasonable. It made this finding in disposing of about 40 formal complaints made against the Pennsylvania State rates. The condemned rates were the same as those fixed by the Interstate Commerce Commission for hauls of like distance in the Hoch-Smith proceeding. The reduced intrastate rates were ordered into effect 20 days from Feb. 17, but later the Pennsylvania commission postponed the effective date to April 10.

Pittsburgh Steel Mills at Disadvantage, They Say

Iron and steel manufacturers in Pennsylvania, especially those in the Pittsburgh district, in strongly urging lower short-haul rates, declared that by reason of the long distances over which switching rates applied in the Chicago district and the unusually short distances over which switching rates applied in the Pittsburgh district, they were placed in a disadvantageous position in competing with Chicago producers.

The Pittsburgh manufacturer said that 80 miles was the maximum haul in the Chicago district, while nine miles was the longest haul in the Pittsburgh district under switching rates. It likewise was pointed out that there is sharp water and truck competition in the Pittsburgh district. Contention was made that the water and truck carriers would get much more short-haul business unless rates were cut.

Evidently the Central Freight Association railroads, as indicated by the proposed short-haul rates, feel that steel makers in other sections which they serve should be granted rates as low as those prescribed by the Pennsylvania commission. By this voluntary action it appears likely that any probability of the Interstate Commerce Commission ordering cancellation of the Pennsylvania rates has been definitely avoided.

Significance has been placed on the fact that the hearings in Pittsburgh will be held before representatives of both the Trunk Line and Central Freight associations. The interpretation here is that it indicates that the Trunk Line carriers are also preparing to reduce short-haul rates on steel in their territory. New England rates are based on a scale 10 per cent higher than the basic scale for Official Classification territory. The proceeding is being watched with interest. The Interstate Commerce Commission apparently is agreeable to the carriers' establishing the proposed short-haul rate reductions.

It is believed that if the reduced rates are put into effect, as seems likely, the Illinois Freight Association carriers will also voluntarily reduce rates on iron and steel in its territory, which covers such important centers as the Chicago district and the St. Louis district.

Proposed and Present Short-Haul Rates on Iron and Steel Products in Central Freight Association Territory

(Rates in Cents per 100 Lb.)

	Proposed	Present
5 miles and under	3	6
10 miles and over 5	3¾	6½
15 miles and over 10	4½	7
20 miles and over 15	5¼	8
25 miles and over 20	6	8½
30 miles and over 25	6½	9
35 miles and over 30	7¼	9½
40 miles and over 35	8	10
45 miles and over 40	8½	10½
50 miles and over 45	9¼	11
55 miles and over 50	10	11½
60 miles and over 55	10½	12
65 miles and over 60	11¼	12½
70 miles and over 65	12	13
75 miles and over 70	12½	13½
80 miles and over 75	13¼	14
85 miles and over 80	14	14½
90 miles and over 85	14½	15
95 miles and over 90	15½	15½
100 miles and over 95	16	16

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Navy to Buy 3045 Tons of Special Plates

WASHINGTON, March 31.—The Bureau of Supplies and Accounts, Navy Department, will open bids April 10 on approximately 3045 tons of special treatment plates for the battleships New Mexico and Mississippi which are being modernized. The plate tonnage is for delivery at the Philadelphia and Norfolk, Va., navy yards.

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Steel Castings Orders Off in February

WASHINGTON, March 31.—Orders for commercial steel castings in February totaled 40,062 net tons, representing 27.5 per cent of capacity, against 46,635 tons, or 32 per cent of capacity, in January, according to reports received by the Bureau of the Census from 131 establishments.

The February output reported was 49,313 tons, or 33.9 per cent of capacity, a gain of 3153 tons over January, when the output reported was 46,160 tons, or 31.7 of capacity.

February orders consisted of 9124 tons of railroad specialties and 30,938 tons of miscellaneous castings. The production consisted of 13,909 tons of railroad specialties and 35,404 tons of miscellaneous castings.

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Bids of Eastern Mills Low on Steel for Navy

WASHINGTON, March 31.—With bids of 1.87½c., Philadelphia, and 2c., Norfolk, Va., for plates, and 1.81c., Philadelphia, and 1.91c., Norfolk, for shapes, John T. Hill, Baltimore, submitted the lowest figures for 3500 tons of plates and 600 tons of shapes for modernizing the battleships New Mexico and Mississippi at the Philadelphia and Norfolk navy yards respectively. Mr. Hill bid as representative of the Central Iron & Steel Co., Harrisburg, for the plate tonnage and of the Phoenix Iron Co., Phoenixville, Pa., for the shape requirements.

Pennsylvania Railroad Awards 124,900 Tons of Steel

Large Contracts Let to Eight Companies for Electrification Work and Station Improvements

CONTRACTS for approximately $7,500,000 worth of structural steel and accessories were placed Tuesday by the Pennsylvania Railroad. The material will be used in pushing forward the railroad's $175,000,000 improvement program, recently announced by W. W. Atterbury, president, including the electrification of its lines between New York and Washington and terminal improvements at Newark, N. J., and Philadelphia.

The structural steel contracts totaled about 124,900 tons and were awarded to eight different companies. The following steel companies shared the order: American Bridge Co., Ambridge, Pa., 26,000 tons; Shoemaker Bridge Co., Pottstown, Pa., 14,000 tons; Ingalls Iron Works, Verona, Pa., 13,000 tons; Mount Vernon Bridge Co., Mount Vernon, Ohio, 4300 tons; Fort Pitt Bridge Works Co., Canonsburg, Pa., 4000 tons; McClintic-Marshall Steel Corpn., Steelton and Pottstown, Pa., 34,000 tons; Lehigh Structural Steel Co., Allentown, Pa., 4000 tons; Phoenix Bridge Co., Pottstown, Pa., 1600 tons.

About Half for Electrification

Nearly one-half of the steel order will be used in speeding up the work of electrifying the Pennsylvania lines between New York and Washington. A total of 47,000 tons of fabricated steel is included for steel poles, crossarms, beams and braces to carry the electric power lines for overhead signal bridges and for substations where switching equipment and electric power transformers are located. The work of erecting the necessary steel to carry the power lines between the Pennsylvania Railroad's Sunnyside Yard on Long Island and Manhattan Transfer, N. J., has been practically completed. Work will go forward immediately on the sector between Manhattan Transfer and Trenton, N. J., where the railroad's present main line electrification begins. The electrified line now extends from Trenton as far as Wilmington, Del. At the same time, work will also get under way between Wilmington and Washington.

Construction to be undertaken immediately on the new passenger terminal at Philadelphia will require 18,000 tons of the steel order. Preliminary ground work on the Philadelphia station is already progressing rapidly, following the recent award of a $1,500,000 contract for excavation and foundation.

Steel for three new bridges over the Passaic River, approaching the site of the new Pennsylvania passenger station at Newark, as well as for the stations, platforms, viaducts and track bridges for additional track at that point, will total an additional 24,000 tons, but the name of the fabricator has not yet been announced.

Fabrication of the steel will be started immediately. Additional orders for signal power equipment and accessories for the electrical work between Manhattan Transfer, N. J., and Sunnyside Yard, L. I., involving the expenditure of approximately $100,000 were also announced.

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Pig Iron and Scrap Totals for 1929 Are Revised by Census

WASHINGTON, March 31.—Revised figures announced today by the Bureau of the Census show that the consumption in 1929 of pig iron was 41,462,214 tons, costing $677,861,682, while the consumption of scrap was 39,120,989 tons, costing $547,280,149.

These figures exceed by 315,663 tons previous totals given for pig iron consumption and by 2,857,480 tons the figures given previously for scrap. The difference in pig iron totals was due to reports not covering all purchases, while the wide disparity in the scrap figures was due largely to omission of some important home scrap tonnages.

The revised figures give consumption by steel works as 29,356,522 tons, exceeding prior total by 2,858,247 tons. The revised report supplements the previous one by showing consumption by States. These figures are shown in the accompanying table.

Consumption by States

(In Gross Tons)

	Pig Iron	Scrap
Alabama	2,052,572	886,291
Arkansas	669	11,702
Connecticut	156,813	151,323
Florida	639	3,144
Georgia	55,421	119,119
Illinois	3,942,622	3,623,560
Indiana	1,467,542	4,063,966
Iowa	110,656	120,219
Kansas	7,500	90,647
Kentucky	367,732	640,901
Louisiana	3,436	26,905
Maine	8,350	9,546
Massachusetts	207,073	286,180
Michigan	874,153	756,829
Minnesota	281,903	372,768
Mississippi	1,848	1,352
Missouri	119,311	541,897
New Hampshire	4,834	4,069
New York	1,979,087	1,769,345
North Carolina	7,650	11,370
Ohio	9,086,890	8,483,345
Oklahoma	2,032	35,513
Pennsylvania	13,790,019	12,649,535
Rhode Island	45,668	36,345
South Carolina	1,655	1,793
Tennessee	175,229	84,033
Texas	10,919	108,283
Vermont	6,714	7,829
West Virginia	804,061	906,155
Wisconsin	356,696	289,357
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	666,324	1,549,439
Delaware, District of Columbia, Maryland, New Jersey, Virginia	1,865,884	1,470,115
Nebraska, North Dakota, South Dakota	312	8,114
Total	41,462,214	39,120,989

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Steel Furniture Orders Lower in February

WASHINGTON, March 31.—Orders for steel furniture stock goods in the "business group" totaled $1,507,768 in February, compared with $1,798,140 in January, according to reports received by the Bureau of the Census from 34 manufacturers. Unfilled orders at the end of February were valued at $841,629, against $932,664 at the end of January. Orders for shelving furniture in February were valued at $374,660, against $375,598 in January, according to reports from 16 companies. Unfilled orders at the end of February rose to a value of $407,030 from $387,934 at the end of January.

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Steel Barrel Plants at 27% Operation

Members of the Steel Barrel Manufacturers' Institute reported an average operation of 26.8 per cent of their productive capacity for February. Only 5.9 per cent was registered for the I.C.C. barrel capacity and 32.7 per cent for the light barrel capacity. Shipments for the month aggregated 271,788 units and the volume of business was $623,456. Unfilled orders on March 1 called for 575,990 barrels, or a little more than two months' operations at the February rate.

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To Investigate Tariffs on Aluminum Alloys

WASHINGTON, March 31.—The Tariff Commission has instituted an investigation under the flexible provision regarding differences in the domestic and foreign costs of production of silicon aluminum, aluminum silicon, alsimin, ferrosilicon aluminum and ferroaluminum silicon. The Hawley-Smoot duty is 5c. a lb. No date for the hearing has been set.

Exports and Imports at Lowest Monthly Totals in Years

WASHINGTON, March 27.—Exports of iron and steel products from the United States in February, aggregating only 91,212 gross tons, were the lowest since August, 1921, when they amounted to 75,827 tons. Imports in February, totaling 28,045 tons, were the smallest since January, 1924, when they were 26,675 tons. The February outgoing movement, however, was only 1533 tons under January shipments and marked an increase from 2992 tons to 3258 tons in the daily average.

In the first two months of 1931 exports, at 183,957 tons, showed a decline of 237,034 tons from the corresponding period of last year.

Imports in February, reflecting a decrease of 12,736 tons from those in January, averaged 1001 tons daily, compared with 1317 tons. Imports in the first two months of the current year, 68,826 tons, were 18,124 tons less than those in the like period of 1930.

February shipments to Canada, amounting to 45,081 tons, were 49.42 per cent of the total exports. In the first two months of the year shipments to Canada, totaling 86,572 tons, were 47 per cent of all exports for this period. The more important shipments to Canada in February were scrap, 8174 tons; plain heavy structural steel, 7797 tons; plates, 5086 tons; skelp, 4944 tons; black steel sheets, 3726 tons; and steel bars, 2905 tons.

Taking only 4882 tons, Japan was in third place among countries taking our products, instead of in the usual second position. The largest item going to Japan was 1268 tons of tin plate. China, with 6590 tons, stood second in February, with Mexico fourth and Chile fifth.

Of the 9937 tons imported from Bel-

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Exports of Iron and Steel from the United States

(In Gross Tons)

	February		Two Months Ended February	
	1931	1930	1931	1930
Pig iron	606	1,897	1,025	4,030
Ferromanganese	13	82	13	209
Scrap	10,690	18,779	20,084	106,212
Pig iron, ferroalloys and scrap	*11,309*	*15,758*	*21,122*	*110,451*
Ingots, blooms, billets, sheet bar	502	3,021	1,103	6,350
Skelp	4,944	5,080	12,901	9,834
Wire rods	3,363	4,373	6,611	7,854
Semi-finished steel	*8,810*	*12,474*	*20,615*	*24,038*
Steel bars	5,190	8,025	9,113	19,882
Alloy steel bars	768	474	1,201	1,515
Iron bars	124	170	168	401
Plates, iron and steel	5,571	10,827	7,677	20,888
Sheets, galvanized steel	3,219	7,958	7,256	17,507
Sheets, galvanized iron	435	638	1,152	1,343
Sheets, black steel	7,447	11,943	15,158	24,902
Sheets, black iron	527	979	1,240	2,196
Hoops, bands, strip steel	3,797	5,121	7,245	8,448
Tin plate; terne plate	7,752	22,857	14,532	46,679
Structural shapes, plain material	8,514	15,265	17,848	29,374
Structural material, fabricated	5,940	11,146	9,126	22,181
Tanks, steel	552	1,391	2,254	2,636
Steel rails	5,133	6,844	6,397	12,511
Rail fastenings, switches, frogs, etc.	446	1,237	949	2,906
Boiler tubes	661	1,784	1,430	3,262
Casing and oil-line pipe	2,321	7,175	6,449	14,937
Pipe, black and galvanized, welded steel	3,621	7,364	8,324	17,024
Pipe, black and galvanized, welded iron	193	1,756	914	4,557
Plain wire	1,162	2,083	2,670	4,969
Barbed wire and woven wire fencing	2,179	2,884	4,946	5,317
Wire cloth and screening	99	144	164	314
Wire rope	276	568	524	980
Wire nails	561	532	1,539	1,049
Other nails and tacks	291	561	793	1,189
Horseshoes	2	7	4	10
Bolts, nuts, rivets and washers, except track	434	1,245	939	2,367
Rolled and finished steel	*65,215*	*136,078*	*129,901*	*269,344*
Cast iron pipe and fittings	2,213	2,973	4,731	5,765
Malleable iron screwed fittings	586	1,259	1,268	2,566
Car wheels and axles	224	1,049	1,209	1,822
Iron castings	651	811	1,048	1,475
Steel castings	718	442	1,151	1,048
Forgings	806	1,127	1,596	1,875
Castings and forgings	*5,208*	*7,661*	*11,003*	*14,561*
All other	670	1,253	1,316	2,597
Total	91,212	197,225	183,957	420,991

Imports of Iron and Steel Products into the United States

(In Gross Tons)

	February		Two Months Ended February	
	1931	1930	1931	1930
Pig iron	3,456	8,215	14,597	17,295
Sponge iron	107		208	
Ferromanganese and spiegeleisen*	2,497	5,815	5,280	11,305
Ferrochrome†	....	42	....	87
Ferrosilicon‡	38	335	308	804
Other ferroalloys	149	....	284	....
Scrap	415	1,642	2,129	5,697
Pig iron, ferroalloys and scrap	*6,662*	*16,049*	*22,806*	*35,188*
Steel ingots, blooms, billets, etc.	1,367	1,770	4,220	3,555
Wire rods	1,038	1,115	1,622	2,059
Semi-finished steel	*3,005*	*2,885*	*5,842*	*5,614*
Concrete reinforcement bars	3,110	3,360	6,047	5,659
Hollow bar and drill steel	67		145	
Merchant steel bars	3,432		7,719	
Iron bars	34	111	143	226
Iron slabs	....		....	
Boiler and other plate	27	365	83	1,022
Sheets, skelp and saw plate	2,087	936	3,254	2,992
Tin plate	4	13	25	22
Structural shapes	4,341	12,382	11,120	21,332
Sheet piling	90		90	
Rails and rail fastenings	450	98	749	697
Welded pipe	305	396	584	987
Other pipe	1,280	1,221	2,864	3,894
Barbed wire	403	695	1,032	1,072
Round iron and steel wire	389	275	563	722
Telegraph and telephone wire	2	1	8	1
Flat wire and strip steel	63	100	107	309
Wire rope and strand	89	155	245	452
Other wire	73	21	133	76
Hoops and bands	1,248	1,731	2,807	2,439
Nails, tacks and staples	625	274	1,209	869
Bolts, nuts and rivets	92	49	233	75
Horse and mule shoes	2	....	2	....
Rolled and finished steel	*18,213*	*22,183*	*39,162*	*42,846*
Cast iron pipe and fittings	3	2,049	729	3,001
Castings and forgings	162	160	287	301
Total	28,045	43,326	68,826	86,950
Manganese ore*	9,560	21,670	27,007	60,292
Iron ore	94,529	203,140	244,215	495,975
Magnesite (dead burned)	4,556	105	6,386	9,372

*Manganese content only.
†Chromium content only.
‡Silicon content only.

gium in February, 2259 tons consisted of structural shapes and 1515 tons of merchant steel bars. Included in the total shipments of 6438 tons received from Germany, were 1289 tons of structural material and 986 tons of merchant steel bars. Imports from India, 3303 tons of pig iron, represented all but 153 tons of total incoming shipments of that product.

Of the 2497 tons of ferromanganese imported, 1565 tons came from Canada and 907 tons from the United Kingdom. The Gold Coast of Africa supplied 3352 tons of the 9560 tons of manganese ore imported. The Union of South Africa furnished 2602 tons; Brazil, 2512 tons; and India, 1040 tons. The manganese ore situation was unusual in that it showed no imports from Russia.

Imports of iron ore from Russia, however, were 15,050 tons, compared with 20,713 tons in January, and were exceeded only by those from Chile, amounting to but 64,466 tons.

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Malleable Foundries at 34.1% in February

WASHINGTON, March 31.—Orders for malleable castings in February amounted to 32,279 tons, compared with 32,658 tons in January, according to reports received by the Bureau of the Census from 115 establishments. Production increased to 33,251 tons, or 34.1 per cent of capacity, from 31,384 tons, or 31.6 per cent of capacity. Shipments also made a slight gain, rising to 32,511 tons from 31,656 tons.

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General Electric Enters Heat Control Field

A new corporation, to be known as the Penn Heat Control Co., in which the General Electric Co. has a controlling interest, has been formed to take over all assets, including patents and good will, of the Penn Heat Control Corpn., Philadelphia, specializing in apparatus for automatic regulation of temperature in household heating. The new company will continue and expand the work previously done by the Penn Heat Control Corpn.

Recent marked improvements in the automatic regulation of temperature and the steadily increasing demand for it lies back of the entrance of the General Electric Co. into the field of domestic heat control. The replacement of hand-firing, whether in control of coal, oil or gas heating, by electrically operated methods of regulation is foreshadowed in much of the new apparatus now being manufactured. A wide range of General Electric products for use in the field will be developed and details concerning them will shortly be announced.

Cribbing Offers New Use For Sheet Metal

A RECENTLY developed use for sheet metal is in cribbing for retaining walls, a special design of which is being made by the American Rolling Mill Co., Middletown, Ohio, using galvanized ingot iron sheets. The metal cribbing is simple in design, so that a wall may be built up from standard formed 6 and 8-ft. sections locked together.

While under development, the cribbing was subjected to exhaustive tests for compression, shearing and bending of the units, separately and locked together. Certain advantages are suggested by the maker, of primary importance being economy of installation and increased speed in construction of cribbing. The metal wall is in service as soon as completed, no interval for "curing" being necessary.

The individual units are claimed to be only 25 per cent of the weight of other cribbing, which serves to reduce cost of transport, expense in handling and the necessity for special handling equipment. A metal wall can be erected without difficulty by unskilled labor.

The units, being of steel, are not subject to breaking or chipping if dropped, and, being non-porous, do not assimilate water, a disadvantage under freezing and thawing conditions. As the units are of light weight, they may be laid on foundation soils, which would require piling or a caisson subfoundation if a heavy mass wall were being constructed.

The maker urges the flexibility of this cribbing as a special advantage, pointing out that it may be dismantled and relocated without loss. Also the height of wall may be increased and the wall itself may be curved if desired. When closed face walls are required, a metal filler plate has been designed to fit in between the units and prevent backfill from filtering through.

Metal cribbing is being recommended particularly for use by railroads and in highway retaining walls, for bridge wingwalls and for river and harbor bank protection. The manufacturer believes that it will be of special advantage in building up underwater crib foundations, as large sections of cribbing may be bolted together before submersion. In this connection it is pointed out that sheet metal culverts of the same material have been used with satisfactory results for the past 25 years.

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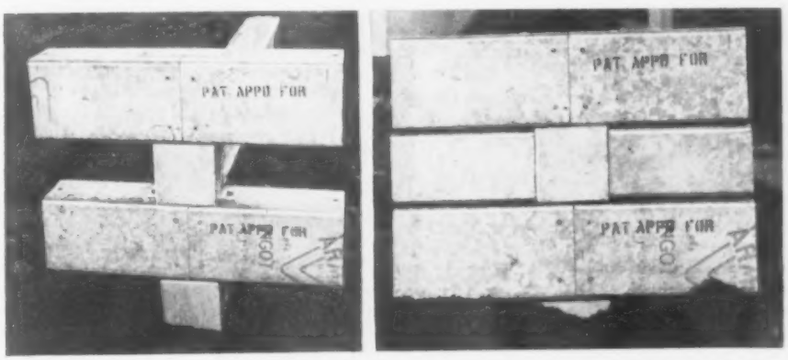
Bethlehem Denies Bonuses Have Been Excessive

The Bethlehem Steel Corpn. on March 28, filed its answer in the Chancery Court in Newark to the suit filed by Waldron M. Ward and others to recover all or part of the money paid to executives in the form of bonus. Denial is made that the bonus payments have been inflated beyond the original conception of the plant and beyond the "bounds of discretion." The answer also specifically denies the charge that the continuance of the bonus payments on "such a scale and basis" has become extravagant and wasteful of assets. It is also stated in the answer that the directors, in awarding these payments, have not violated their duties or trusts, as charged.

Care has been exercised, it is stated by the corporation, to prevent a general disclosure of bonus payments for the reason that such a disclosure would adversely affect the purpose which the system was designed to accomplish.

It is claimed in the answer that "the minority stockholders, representing 1 per cent of the total preferred and common shares, are not entitled to bring or maintain this suit."



IN this special display of metal cribbing, the header is a 6-ft. standard section extending into the earth. The spreaders, however, have been cut shorter than the standard 6 or 8-ft. length as a convenience in shipping the unit for display purposes. Where there is the possibility of a backfill, special filler plates are furnished for installation in the cribbing walls.

OFF THE ASSEMBLY LINE

April Automobile Output Estimated at Between 330,000 to 350,000 Units

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Motor car output in March in United States and the Dominion is estimated at 275,000 to 300,000 units.

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March bookings of steel mills from the automobile industry showed a gain of 20 per cent over those in February. Pig iron shipments increased a like amount.

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Ford of Canada produced its millionth car the past week; Chevrolet will build its eight millionth car before mid-summer.

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Chrysler and other companies reported preparing to adopt free wheeling principle.

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DETROIT, March 30.

THERE has been a further gain in automobile production the past week, with the result that the month's total will be between 275,000 and 300,000 cars. The industry is entering April with a program which should carry the month's output up to 330,000 to 350,000 units. Although manufacturers can see relatively good business ahead for the next 30 days and fully expect a seasonal improvement in May, the optimistic tone is tinged with reservations. They are still unwilling to predict more than a few weeks in advance, and in some cases are readjusting factory operations every seven days as reports come in from the retail trade.

Steel mills have fared well this month at the hands of automobile makers so far as tonnage is concerned, specifications having been 15 to 20 per cent better than in February. One large producer showed an increase in bookings of 40 per cent. The pickup carried over also into pig iron, one important furnace interest having shipped 20 per cent more iron in March than in February. The unfortunate thing is that finished steel business, especially in light-rolled products, has been taken at the expense of prices. The disintegration of the price structure has not been entirely confined to steel, for a similar condition in the malleable foundry industry has come to light. Pressing for lower quotations on contracts for malleable castings, one of the leading automobile companies is said to have secured prices as low as 3.75c. a lb., which many foundrymen believe is less than the cost of manufacture. It is understood that the normal rate paid for this type of work has been 6c. a lb. and higher. This development is not surprising, as many foundries are short of bookings and automobile companies in turn are endeavoring to maintain already narrow profit margins by purchasing materials as cheaply as possible.

Ford Schedules Increased

THE Ford Motor Co. is said to have augmented its production the past week. Some departments at the Rouge plant are reported to have gone over recently from three to four days a week and the final assembly line continues at five days, but most manufacturing divisions are holding to a three-day-a-week schedule. There are numerous stories about all of the production departments going over to four days, but no official statement has been made in this connection. The Ford steel plant is operating at a good rate, with all open-hearth furnaces running.

Chevrolet is well satisfied with the current program, which calls for an April output slightly above its March figure, which is put at 75,000 to 78,000 cars. Chrysler is expected to turn out 25,000 cars this month and 30,000 in April. The Plymouth division has increased its assemblies to 500 a day, five days a week; Dodge is now making 600 a day. Changes are imminent in the Chrysler line, particularly in the abandonment of the present transmission in favor of one based on the free wheeling principle. There is some talk about a new Plymouth car. It will be remembered that no changes were made in the Plymouth at the time of the automobile shows. Some observers point out that the Chrysler Corpn. would tremendously strengthen its position by putting on the market a Plymouth which would take with the public, as this division has been perhaps its weakest unit.

Changes Impending at Packard

IT is likewise known that some changes are impending at Packard. One story has it that a companion car to the Packard to sell around $1,500 is in the offing. Willys-Overland has increased its production substantially, with about 10,000 cars coming off the line this month and a slightly higher number planned for April. Its foundry subsidiary at Pontiac, which makes its engines, has shown signs of a revival in the last few weeks. Buick assembled more than 10,000 cars in March and will manufacture about 12,000 during the coming month. Oakland-Pontiac has an April schedule comparable with Buick's. Cadillac still is operating at a satisfactory rate, with March production at 2500 cars and April promising 3000. Studebaker is reported to have turned out 6000 cars this month, with an increase set for April. Auburn continues very busy at its Auburn and Connersville, Ind., plants. Auburn bodies are painted and trimmed at Auburn and thence sent

to Connersville, where main Auburn production is concentrated. A supplemental Auburn assembly line has recently been started at Auburn. All Cords are made at Auburn and bodies at the Kalamazoo body plant. Reo's name is associated with reports of a companion car to the Royale, soon to make its appearance. It will sell at considerably less than the present Royale, the price of which has been readjusted upward.

Hupp and Reo to Produce in Canada

IN line with the movement among American automobile companies to manufacture cars in Canada, now that the import duties have been placed at what amounts in some cases to an almost prohibitory figure, Hupp Motor Car Corpn. has arranged for production of its cars in Windsor in a plant having 30,000 sq. ft. of floor space. Simultaneously comes the announcement that Reo will begin April 1 to assemble passenger cars, trucks and buses in the former Dodge Brothers plant at Toronto. Meanwhile, the millionth Ford car manufactured in Canada came off the assembly line at Ford's East Windsor plant on March 24. A town sedan finished in maroon, this car will be exhibited in various Canadian cities in the next few months. If one is thinking in terms of mass production, it is of interest to observe the prediction of Chevrolet officials that the eight-millionth Chevrolet will be built before mid-summer. More than half of this output has been achieved in the last four years.

Graham Brothers Answer Suit

THE Graham-Paige Motors Corpn. and the three Graham brothers have filed an answer to the suit entered recently by Chrysler Corpn., charging that they have manufactured and sold buses and trucks in violation of an agreement between them and the Dodge company, now a Chrysler subsidiary. They state that they have produced only commercial cars, comprising passenger car chassis with light delivery bodies, which do not fall under the classification of trucks as defined in the agreement.

They further point out that "almost from the inception of the automotive industry the manufacturers of passenger cars have manufactured or assembled bodies adapted for commercial purposes on the regular standard passenger car chassis and sold them in the course of their regular business in passenger cars, and have likewise sold standard passenger car chassis without bodies with the intention and knowledge that the purchasers would install commercial bodies thereon, and the same has always been regarded by the trade and public in general as not being in the truck or bus business."

The Graham brothers declare that the value of the Graham name to Chrysler is grossly exaggerated, in support of which statement they assert that the Chrysler Corpn., after acquiring the Dodge company, substituted the Dodge name on trucks and buses formerly bearing the name of Graham Brothers.

Ford Conducts Large Shipping Business

TWO 300-ft. cargo ships, said to be the largest ever built for service between the Great Lakes and the Atlantic seaboard and the first turbine boats of that type ever constructed, have been ordered by the Ford Motor Co. from the Great Lakes Engineering Works, River Rouge, Mich. No wood will be used in these ships and the superstructures will be collapsible, so that masts and stacks may be lowered to the deck when the ships are passing under bridges. Pilot houses may be dropped into wells to afford adequate clearance. Each of the nine hatches will have covers opening telescopically through which freight will be handled. The ships will be delivered June 1 and 15, the rapid construction being made possible by the use of steel throughout. The ships will ply in canal and coastwise traffic.

Freight tonnage carried by the Ford Great Lakes fleet during 1930 totaled 2,785,396 net tons, exclusive of lumber and grain. Coal comprised the bulk of the shipping. The steamers Henry Ford II and Benson Ford, each of 13,000 tons' capacity, were engaged almost entirely in carrying coal and iron ore. The coal, amounting to 1,491,782 tons, was hauled by rail from the Ford mines in Kentucky and West Virginia to Toledo, where it was transferred to the boats for shipment principally to the Rouge plant, to the coal storage docks at Duluth, and the Ford sawmills at L'Anse, Mich. On the return trips from the Upper Lakes, ships were loaded with iron ore at Superior or Ashland, Wis., and at Marquette or Escanaba, Mich. Ford barges have been largely used in floating lumber from the north to the Rouge works. Cargoes of limestone for the blast furnaces and cement plant have been brought down from Calcite, Mich. Ore brought to Rouge in this manner totaled 655,074 tons.

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Iron Content of Lake Ore Gained Slightly in 1930

The average iron content of Lake Superior ore showed a slight gain last year, which was the second year in succession in which there was a little increase in the content. The average iron content of all grades was 51.33 per cent iron natural, compared with 51.18 per cent during the previous year, according to the annual report of the Lake Superior Iron Ore Association. The range during the past 10 years has been 52.07 per cent in 1921 down to 51.15 per cent in 1928.

The report includes tables showing the analyses of all grades of ore for all ranges for a 10-year period. The average content of phosphorus was 0.095 per cent, compared with 0.100 the previous year. Silica increased from 8.48 to 8.70 per cent and manganese from 0.80 to 0.82 per cent last year. Moisture declined, having been 10.92 per cent, compared with 11.24 per cent the previous year.

Low phosphorus non-Bessemer ore composed 63.9 per cent of the total shipped last year, or a gain of 0.9 per cent over the previous year. The percentage of this ore to total shipments has shown an upward tendency for several years. This grade has an iron content of 50.82 per cent, compared with 50.73 per cent during the previous year. Nearly 74 per cent of the low-phosphorus non-Bessemer ore was shipped from the Mesabi district, and the iron content of this grade mined in that district was 50.07 per cent, compared with 50.03 in 1929.

The iron content of all other grades of ore also showed a little increase the past year. Bessemer ore had an iron content or 54.67 per cent, against 54.57 per cent during the previous year. High-phosphorus non-Bessemer showed an iron content of 51.56 per cent, compared with 51.22 per cent the previous year. Manganiferous ore increased to 43.70 per cent in iron content from 43.18 per cent, and silicious ore was 37.49 per cent iron, compared with 37.39 the previous year.

All the ranges showed a little increase in the iron content of ore mined last year except the Marquette range. Iron content of all grades mined in the Mesabi district increased from 51.19 to 51.20 per cent. Gogebic range increased in ore content from 52.49 per cent to 52.81 per cent, the Menominee range from 50.42 to 50.94 per cent, the Vermilion range from 58.59 per cent to 58.69 per cent and the Cuyuna range from 44.71 per cent to 45.20 per cent. In the Marquette range the iron content was 49.90 per cent, compared with 50.47 per cent during the previous year.

Shipments of ore by grades last year were: Low-phosphorus non-Bessemer, 29,842,018 tons; Bessemer, 11,370,122 tons; high-phosphorus non-Bessemer, 3,039,361 tons; manganiferous, 1,694,984 tons; silicious, 752,069 tons.

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Sales of babbitt metal in February totaled 1,819,749 lb., against 2,089,574 lb. in January, according to reports received by the Bureau of the Census from 33 manufacturers. Production reported by 43 establishments was 2,507,222 lb., compared with 2,885,693 lb.

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Browning Crane Co., Cleveland, has changed its name to the Browning Crane & Shovel Co.

Steel Founders Hold Sales Clinic

More than 150 steel foundrymen attended the March meeting and sales clinic of the Steel Founders' Society at the Neil House, Columbus, Ohio, March 19 and 20. The sales clinic was directed by E. St. Elmo Lewis, counselor in consumer and industrial relations, Philadelphia.

Keith Williams, vice-president and general manager of Pratt & Letchworth Co., Buffalo, was elected to the board of directors of the society to fill the vacancy caused by the death of R. J. Doty, Reading Steel Casting Co., Inc., Reading, Pa.

W. Trinks, professor of mechanical engineering at Carnegie Institute of Technology, presented a paper on the "Selection of Materials in Machine Design." Fred D. Van Amburgh, New York, addressed the luncheon meeting, on the subject, "How to Fail."

French Lick Springs was selected for the mid-summer convention of the society, which will be held on June 17, 18 and 19. The next regular meeting of the society is scheduled for the William Penn Hotel, Pittsburgh, April 23.

Announcement was made of the establishment of a development engineering department at society headquarters, under the direction of John J. Baum, engineer and metallurgist. This department will devote its major effort toward new uses and new applications for cast steel. It is also prepared to extend engineering service and advice to manufacturers who have a problem in the construction of their materials where cast steel in any form might be considered.

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Sharp Decline in Pig Iron Imports

Imports of pig iron in February are reported by the United States Department of Commerce at 3456 gross tons. This is less than one-third the January import movement and is the smallest monthly total since March, 1922. It compares with 8900 tons in February last year. All but 153 tons of the February total came from British India.

Comparing the first two months with the first two months of 1930, there has been a reduction of about 20 per cent. Most of this drop came from the virtual stoppage of imports of pig iron from Great Britain. There was a reduction in arrivals of Indian iron, which was almost offset by an increase in iron from Sweden.

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Inland Steel 1930 Additions Cost $7,378,367

The Inland Steel Co., Chicago, in its pamphlet report for 1930, states that expenditures for new construction and additions during last year amounted to $7,378,367, the more important items including additional open-hearth capacity, a 10-in. continuous bar mill, a new power plant, a sintering plant, and a new administration building.

The company has recently begun work on a large continuous mill for producing wide strip, sheet steel and steel plates, this project to be completed early in 1932. Inland Steel recently sold $15,000,000 in first mortgage sinking fund 4½ per cent gold bonds to reimburse the company for 1930 expenditures and to provide additional funds for the new wide strip mill.

Earnings of the Inland Steel Co. last year were equivalent to $5.41 a share, compared with $9.76 in 1929.

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River Shipments of Steel Fall Off in February

Shipments of iron and steel products on the Ohio River in the Pittsburgh district during February were 75,264 net tons, according to the United States Engineer office, Pittsburgh. This compares with 88,089 tons in January, and with 74,385 tons in February, 1930. Steel shipments on the Monongahela River during February totaled 58,847 tons, compared with 90,405 tons in January and with 80,327 tons in February last year. No steel was moved on the Allegheny River during February, and only 50 tons in the preceding month.

United States Imports of Pig Iron by Countries of Shipment

(In Gross Tons)

	February		Two Months Ended February	
	1931	1930	1931	1930
United Kingdom	50	631	100	2,789
British India	3,303	7,417	11,639	13,301
Germany	....	....	....	....
Netherlands	50	100	735	453
Canada	....	276	....	276
France	....	....	25	....
Belgium	....	....	....	....
Norway	....	353	51	500
Sweden	....	123	1,876	658
All others	53	....	171	3
Total	3,456	8,900	14,597	17,980

Eaton Axle to Acquire Reliance Mfg. Co.

The Reliance Mfg. Co., Massillon, Ohio, will be acquired by the Eaton Axle & Spring Co., Cleveland, subject to approval of the Reliance stockholders at a meeting April 20. Directors of both companies have acted favorably on the merger. Terms provide for the exchange of four shares of Reliance stock for five shares of Eaton stock. The Reliance company, of which W. H. Crawford is president, manufactures lock washers. The Eaton company manufactures axles, springs, bumpers and other automobile parts and has several plants. Last year it acquired the Wilcox-Rich Corpn., now operated as a subsidiary, which operates plants in Michigan for the manufacture of valves, tappets and piston rings.

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Van Sweringen Interests Stronger in Otis Steel

The Otis Steel Co., Cleveland, has increased its board of directors from 12 to 15 members and has elected as three new members, Alva Bradley, who is identified with the real estate, banking and shipping interests in Cleveland, and president of the Cleveland Baseball Club; George S. Martin, president of Sherwin-Williams Co., and Charles F. Batchelder, vice-president of Chase Securities Co., New York. The election of Bradley and Martin strengthens the representation of the Van Sweringen group in the Otis company, in which the men composing the Van Sweringen interests have large holdings.

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A. O. Smith Plant Books Two Large Pipe Orders

The A. O. Smith Corpn., Milwaukee, has announced the closing of two contracts for electrically welded steel pipe, as follows: 131 miles of 26-in. pipe for Southern Fuel Co., for natural gas line from Kettleman Hills region to Los Angeles, 24,000 tons; 50 miles of 12-in. pipe for Texas Corpn., for oil line from new Kilgore field to Gulf. Tonnage not announced.

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Newton Steel Issues $10,000,000 Bonds

Stockholders of the Newton Steel Co. have authorized a bond issue of $10,000,000, only part of which will be issued at this time. Proceeds will be employed for working capital in connection with the Monroe, Mich., plant, and to retire current issues.

▲▲▲ PERSONALS ▲▲▲

Edward C. Bullard

EDWARD C. BULLARD, vice-president and director of the Bullard Co., Bridgeport, Conn., has been appointed general manager, to succeed his uncle, the late Stanley Hale Bullard. Mr. Bullard is the first of the third generation of the family to assume so important a position in the organization. He is a native of Bridgeport, and received his early education at the Curtis School of Brookfield and at the University School of Bridgeport, where he prepared for the Sheffield Scientific School of Yale University, from which he was graduated in 1917. After familiarizing himself by actual contact with the duties of the several divisions of the Bullard plant, he was made assistant to his father, DUDLEY B. BULLARD, chief engineer, in 1926. Three years later he was appointed an engineer in charge of design and research, and last year was elected a vice-president of the company. He is the oldest grandson of Edward Payson Bullard, founder of the company.

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HARRY C. CRONK, for the past three years electrical engineer of the Tata Iron & Steel Co., Jamshedpur, India, has become associated with the Leningrad, U. S. S. R., group of engineers of the Freyn Engineering Co., Chicago.

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FRANK C. REED, general sales manager of the Westinghouse Electric Elevator Co., New York, has been elected vice-president of the company, succeeding R. I. PHILLIPS, who has resigned. Mr. Reed attended the Massachusetts Institute of Technology, and entered the apprentice training school of the Westinghouse Electric & Mfg. Co. immediately after leaving college in 1903. In 1921 he was made manager of the company's Huntington, W. Va., office, which position he held until 1927, when he went with the Elevator company, with headquarters in Chicago.

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J. I. ANDREWS, vice-president and general manager of sales of the American Sheet & Tin Plate Co., Pittsburgh, has returned from a several weeks' vacation in California.

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GEORGE C. SMITH, for the last three years director of the Industrial Bureau of the Industrial Club of St. Louis, has resigned his position to become general traffic manager of the Missouri-Kansas-Texas Railroad, in charge of freight and passenger traffic and industrial development, with headquarters in St. Louis.

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WALTER W. BERTRAM, who has been with the Morse Chain Co., Ithaca, N. Y., for 18 years, for the past eight years as manager of the New York office, has been made sales manager of the industrial chain division. A. B. WRAY, formerly sales manager, has become chief engineer in charge of all industrial chain engineering, and R. W. APPLETON, formerly director of purchases of Pierce Arrow Motor Car Co., has been appointed purchasing agent.

Walter W. Bertram

J. H. Nead

J. H. NEAD, since 1919 chief metallurgist of the American Rolling Mill Co., Middletown, Ohio, resigned on April 1 to become chief metallurgist of the Inland Steel Co., Chicago. He was graduated in 1909 from the University of Michigan, where he specialized in metallurgy, and for the first nine years after graduation he acquired a broad experience as chief metallurgist of several companies. During the war, while serving in the engineering division of the Ordnance Department, he became acquainted with French steel works operations and metallurgical practice.

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ARTHUR H. SENIOR has been appointed traffic manager of the Union Drawn Steel Co., Beaver Falls, Pa., succeeding the late Arthur H. Boyd. Mr. Senior became associated with the company in 1924 and has been assistant traffic manager since 1928.

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ARCH J. MCFARLAND, who was appointed assistant to the president of the Wheeling Steel Corpn., Wheeling, W. Va., last November, was elected first vice-president of the company at a meeting of the board of directors on March 25. With the exception of five years spent with the Follansbee Brothers Co., Pittsburgh, Mr. McFarland has been with the Wheeling Steel Corpn. and its predecessors during the greater part of his business career. JOHN L. NEUDOERFER, general manager of sales for the Wheeling corporation, has been

elected vice-president in charge of sales. Mr. Neudoerfer has also been identified with the company and its subsidiaries for a number of years, and before his appointment as general manager of sales in May, 1929, he was in charge of sales in the company's pipe division.

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W. C. WITT, for the past nine years sales manager at Chicago for the Lakeside Bridge & Steel Co., Milwaukee, has become general sales manager for A. P. Woods & Co., Rockford, Ill., structural steel fabricators.

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GRANT PIERCE, former president of the National Radiator Co. and New England manager of the American Radiator Co. has been made vice-president and sales manager of the H. B. Smith Co., Westfield, Mass., boiler manufacturer.

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FRANK A. BALL of the L. S. Starrett Co., Athol, Mass., has been made vice-president of the Worcester, Mass., branch of the National Metal Trades Association, and ARTHUR H. STARRETT, a member of the executive committee.

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C. O. CHIEMIE, research metallurgist, H. A. Cramer Co., Chicago, will speak on "Brass Castings" at a meeting of the Quad-City Foundrymen's Association, April 20, at the Davenport, Iowa, Chamber of Commerce.

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L. M. DUNNING and HERBERT A. HOLMES have been made sales representatives of the Chicago and Pittsburgh offices respectively of the Reliance Electric & Engineering Co., Cleveland.

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JOHN J. WALSCH, heretofore superintendent of the electric steel foundry of the Crucible Steel Casting Co., Lansdowne, Pa., has become identified with the Clark Equipment Co., Buchanan, Mich., as works manager.

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WILLIAM A. HAMANN, chairman of the board of the Roessler & Hasslacher Chemical Co., Niagara Falls, N. Y., has retired. He joined the company in 1885 as a clerk and became successively secretary, treasurer, vice-president, and in 1926, president. He became chairman in 1928.

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ARNOLD STUART DURRANT, for the past six years vice-president in charge of commercial relations of the International General Electric Co., Inc., retired from active service on March 1 and was made an honorary vice-president. He has been identified with the General Electric organization for 40 years.

OLIVER F. GANG has been appointed assistant sales manager of the William Powell Co., Cincinnati, maker of valves and engineering specialties.

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JAMES ASTON, consulting metallurgist, A. M. Byers Co., Pittsburgh, is to present a talk on "Byers' New Process for Manufacturing Wrought Iron" before the Boston chapter of the American Society for Steel Treating, April 3, at the Massachusetts Institute of Technology.

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DR. E. F. NORTHRUP, vice-president and technical adviser of the Ajax Electrothermic Corpn., Trenton, N. J., sailed on the Caronia, March 20, for a two months' trip to Europe.

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WILLIAM P. WITHEROW, vice-president of the Republic Steel Corpn., and formerly president of Dilworth, Porter & Co., Inc., Pittsburgh, has been elected a director of the Pittsburgh Chamber of Commerce.

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JOHN F. BLACKIE has been appointed executive vice-president, National Enameling & Stamping Co., Milwaukee. This is a newly created position. Mr. Blackie has been manager of manufacturing for the past six years, with headquarters in St. Louis. He now will return to Milwaukee, but spend part of his time at the other works of the company, in Granite City, Ill., and in the East.

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J. C. MEARS, for seven years resident manager at Chicago for Rogers Brown & Crocker Brothers, Inc., has resigned and will take up his residence at his old home in Cincinnati. He started in the merchant pig iron business 43 years ago in the Cincinnati office of Rogers Brown & Co., which was later joined with Crocker Brothers. After a brief stay in Cincinnati he was transferred to St. Louis, where he spent over 30 years in charge of sales. He was made resident manager at Chicago in 1923.

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EDWARD C. GAINSBORG, heretofore manager of the steel mill division and of the Pittsburgh office of the SKF Industries, Inc., has become sales manager of the industrial division of the Roller Bearing Co. of America, Trenton, N. J.

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GEORGE HUTCHINSON, president, Newburgh Shipyards, Newburgh, N. Y., has been elected president of the Orange County chapter of the New York State Society of Professional Engineers.

▲ ▲ ▲ OBITUARY ▲ ▲ ▲

BEVERLY L. WORDEN, president, Cutler-Hammer Mfg. Co., Milwaukee, died after a long illness at his home in West Orange, N. J., on March 28, aged 60 years. A native of Chicago, Mr. Worden was graduated from the University of Wisconsin in 1893. Eight years later he founded the Worden-Allen Co., of which he was president for the ensuing 20 years. In 1909 he established the Lackawanna Bridge Co., Buffalo, and continued as its president until 1924. In the war period Mr. Worden was general manager of the Newark Bay shipyard at Newark, N. J.

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GUSTAVE W. FALSTROM, president and founder of the Falstrom Co., Passaic, N. J., maker of sheet metal equipment, died at Orlando, Fla., on March 25, aged 85 years.

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JOHN HENRY IWAN, senior partner in Iwan Brothers, South Bend, Ind., manufacturers of post hole digging equipment, died on March 13, aged 89 years.

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PHILIP O. SCHLEUSSNER, vice-president, Roessler & Hasslacher Chemical Co., Inc., Niagara Falls, N. Y., died at his home in Stamford, Conn., on March 21, aged 53 years.

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WILLIAM M. SCAIFE, president of the Air Tight Steel Tank Co., Pittsburgh, died after an operation at the Sewickley Valley Hospital, Sewickley, Pa., on March 26, aged 64 years. He was born in Pittsburgh and, following graduation from the Sheffield Scientific School of Yale University in 1887, had spent his entire life in that city. He was a director in the National Fireproofing Co., Pittsburgh.

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EDWARD DWIGHT PRIEST, designing engineer of the General Electric Co. and chairman of the board of the Parker Wire Goods Co., Worcester, Mass., died at his home in Schenectady on March 26, aged 70 years.

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DANIEL J. KILBY, director and sales manager of the Kilby Mfg. Co., Cleveland, died March 17, aged 60 years. He was a co-founder with his father of the Kilby company. He was a member of the Union Club and Chamber of Commerce, Cleveland.

Secondary Reaction May Be Ahead

BY DR. LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

OUR "composite demand line," partly estimated, shows a more-than-seasonal gain. The adjusted index for February is 77.6 per cent of the average for the years 1921-1927, which compares with 75 in January. We find higher adjusted figures for automobile production, building contracts, miscellaneous manufactures, machine tool orders, and mining and oil activity. Railroad freight tonnage, however, declined and it seems probable that farm purchasing power was lower.

If we assume that steel production was in line with requirements in January, it may be said that the February activity of the chief steel-consuming industries would have justified some increase in steel production. Our preliminary composite demand index for February, however, is approximately the same as the final December figure, while steel production (adjusted) in February was 17 per cent above the December level. Thus the apparent discrepancy between production and requirements remains about unchanged from January and considerably greater than in December.

Making Haste Too Fast

Moreover, in several cases the increased activity in the consuming industries may be considered as undesirable. For example, our mining and oil index rose chiefly because of increased drilling activity in Texas, which will mean overproduction of oil. Average daily copper production increased in the face of excessive stocks of that metal. General manufacturing was much influenced by a gain in textile production, which appears to be of doubtful permanence in view of the price situation in the industry. The gain in automobile production does not appear to have been fully justified by available data concerning automobile sales.

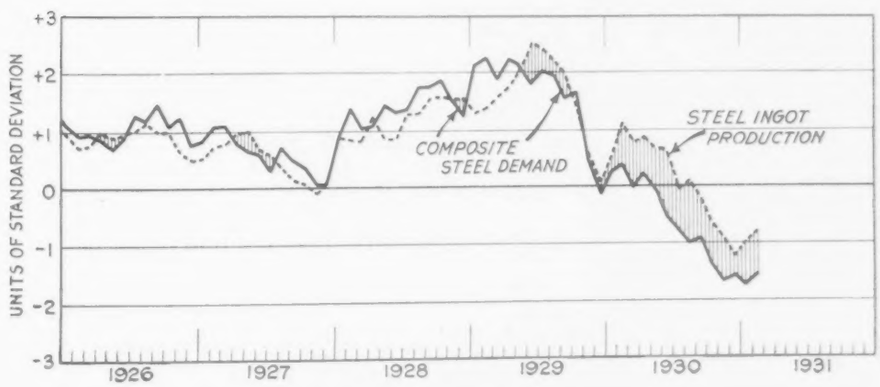
An appraisal of the general situation leads to the diagnosis that the January and February expansion in industry has been one of those preliminary rebounds from an over-sold and under-bought condition which are usually followed by a sort of secondary reaction before the final sustained recovery in industry sets in.

Construction contracts (floor space) awarded in February made a somewhat better than seasonal showing. Building permits, however, touched a new low level for the current recession. Real estate transfers remain very low. The liquidation in the real estate market continues. The bond market is weak. Activity in this field appears to be maintained, at an irregular low level, with the aid of occasional large pieces of miscellaneous construction, a good many of which involve deliveries of steel that will be considerably delayed. But a good volume of heavy structural steel and reinforcing material will doubtless be needed.

Railroad Equipment Buying Low

February freight tonnage fell to new low levels for this recession. Preliminary earnings statements indicate a net operating income at least 45 per cent below a year ago. Dividend cuts suggest a lack of optimism as to an early sustained recovery. Unfilled orders for locomotives were the lowest on record; domestic orders for steam locomotives numbered only two in January and eight in February. Orders were placed for only 24 freight cars, which contrasts with 15,931 in February, 1930.

Slowness of sales suggests doubts concerning the automobile industry. The General Motors Corpn. reported February sales to users gaining distinctly less than usual for the season, while sales to dealers indicate dealer inventories of new cars above a year ago. February registrations of new passenger cars in 41 States increased only 7 per cent over January.



PRODUCTION has gone upward with demand, but for real improvement it must fall below. Sustained gains without intermediate setbacks do not appear probable.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

Money or Goods Transfer?

AN old saying has it in substance that many arguments would not occur if the people first defined their terms. There is what amounts to a controversy now going on about prices, wages, etc., which might be reduced in volume and acrimony if people would make a clearer distinction between money on the one hand and goods and services on the other.

Money is a much misunderstood thing. In certain respects it represents material things or services and is a measure of them, and this leads to people generalizing in their conceptions whereby they think of money and talk in terms of money when they are thinking of goods and services and should therefore talk in terms of goods and services.

What is it that we really want at this juncture in business and economic affairs? Clearly it is a greater movement of goods and the rendering of more service. The rank and file of the people want groceries, the right to occupy houses, etc. Business men want occasion to buy more raw materials, opportunity to add new equipment, etc. It is so all along the line. What we need is a greater movement, more business. If we want money it is not money as such but money as a means to an end, more movement of goods or more service.

Theories or proposals as to what is good for us or bad for us should be considered in terms of movement of goods and rendering of service, not in terms of money. Men are frequently deluded by unjustified assumptions of analogy. In the past hard times have been accompanied by wage reductions, good times by wage advances. Hence to make good times simply advance wages and to make bad times reduce wages, and there you are! The same remark could be made about commodity prices. The analogy is false, for the very best that could be said about it is that it is an interchange between cause and effect and that is certainly a bad enough blunder to make.

If it were simply movement of money we want, let every price, every wage, every salary, be put up 10 per cent. Then there would be 10 per cent greater movement of money. Some of the nostrums proposed have been conceived on the basis of starting an ascending spiral, and there would be a fine start for one!

What we want is more movement, more business measured in the purely physical sense, without regard to the dollars involved. The dollars will take care of themselves. They are merely a means of expression for the things in which we are really interested. Money as such should be our least concern. The point at which we are trying to drive is in a limited way a new thing and that may confuse some people with a recollection of the past crises, when there actually was some shortage of currency.

Whatever is proposed, and proposals arising from right motives and clear thinking must be most welcome, should be judged by what they are calculated or likely to produce in a physical way, in terms of movement of goods and rendering of service, and not in terms of money. It is the production and movement of goods, and the rendering of service, that causes money to move, not vice versa.

Investigating the Rail Price

THE investigation being conducted by the Department of Justice into the price of steel rails, if it results in nothing else, may easily undermine what little degree of stability the steel price structure has attained, and at the same time may delay shipments of rails on 1931 contracts pending the outcome. As rail tonnage forms a very important part in such moderate recovery as the steel industry has experienced during the first quarter, the Department of Justice can render a service to business in general and to the steel industry and its stockholders and employees by making its findings in the shortest possible time consistent with a thorough study of the subject.

Although one large railroad system is understood to have questioned the $43 rail price when about to make its contract for this year's requirements, it is scarcely conceivable that the carriers in general have inspired the investigation. Advices from Washington are that the Interstate Commerce Commission, whose duty it is to watch railroad revenues under the Cummins-Esch law, asked the Department of Justice to look into the alleged price agreement, and its action may have come about as a result of the recent complaint of Senator Couzens of Michigan that rail prices had not changed in nearly a decade despite a downward trend in prices of other steel products.

The railroads are large buyers of steel other than rails. They know better than any except possibly the rail makers themselves that the rolling of rails has become one of the most exacting of all steel mill processes. The insistence of the railroads on higher quality rail steel has perhaps been the most important factor in increased costs of rolling rails. Yet the rail price today is only a few dollars a ton above that of plates, shapes or bars, and at times during

recent years the prices of the latter products have been $10 or $12 a ton higher than the rail price.

The real question at issue is whether the present price is a fair price in relation to costs; also whether there has been a price agreement in violation of the anti-trust laws. As to the latter question, the Federal Court for the Southern District of New York recently ruled in the bolt, nut and rivet case that the fact that one maker announces a price and that others follow does not necessarily constitute evidence of price collusion.

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Pig Iron in an Off Year

TOTAL production of pig iron and ferroalloys in 1930, as now reported by the American Iron and Steel Institute, was 31,752,169 tons. The total as given by THE IRON AGE was 31,399,105 tons, this not including charcoal iron, now reported at 96,580 tons, or ferrosilicon, 337,640 tons. Thus the discrepancy is below one-third of 1 per cent.

The decrease from 1929, the record year, was 25.7 per cent, and production slightly exceeded 1924, a rather good year in the main, while it ran above three earlier post-war years and was above any pre-war year. There is no great interest in that fact now, however, for the reason that production slumped off after April, the high month of the year, and closed with a rate only three-fifths of its average, our report in the issue of Jan. 8 showing a Jan. 1 daily rate of 51,330 tons, against 86,025 tons daily during the year. The March 1 rate was 20 per cent above the Jan. 1 rate.

Pig iron and steel ingots held together quite well in their declines from 1929 to 1930, as ingots decreased about 27 per cent against the 25.7 per cent decrease in pig iron and ferroalloys. In steel-making pig iron the decrease was 26.2 per cent. Foundry and malleable combined had a smaller decline, 23.3 per cent, this being made up of 18.5 per cent decrease in foundry and 32.1 per cent in malleable. Ferrosilicon, again, declined only 1 per cent. Ferromanganese and spiegeleisen declined 24 per cent.

Production of Bessemer pig iron, excluding low-phosphorus, was 9,608,012 tons in 1929 and 7,151,081 tons in 1930, declining 25.5 per cent. While total production of ingots in 1930 is not known precisely, the monthly reports show Bessemer production closely, with a decline of 29.2 per cent. The smaller decline in Bessemer pig iron reflects a smaller decline in its other uses, for ingot molds, acid open-hearth steel, etc.

An interesting point is the extent that steel makers modify their proportions of pig iron and scrap, when operations generally are light, to help the blast furnaces and by-product coke departments. From the first half of last year to the second half there was 30.2 per cent decrease in production of basic pig iron, while from such data as are available there appears to have been about 34 per cent decrease in basic open-hearth steel ingot production. Thus there was not much divergence.

Pursuing the arithmetic, it would appear that something like 400,000 tons more pig iron was made in the second half than would have been required if the first half proportion had been maintained. One should note also that when steel mill operations decline there is work scrap left over, and thus altogether it may be taken that the demand for scrap decreased very considerably more than did the production of basic open-hearth steel.

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The Adventure in Wheat

ANNOUNCEMENT has been made that the Farm Board will not buy any of the 1931 crop of wheat. This meant that it is getting near to the end of its rope. It had an appropriation of $500,000,000. As of July 1, 1931, when all of its contracts have been fulfilled it will have on its hands about 275,000,000 bushels, costing 92c. per bushel, with the present market price about 60c. and a carrying charge of 1.5c. per bushel per month for storage.

It is useless to preach and moralize in respect to this subject. The taxpayers granted the farmers, or rather a portion of them, a half billion dollars with which to play the market and they lost and they are not pacified. Hence the revival of the talk of the debenture, equalizing fee, or bonus. This means a restricted domestic market, the reservation of the right to produce as much wheat as the farmers in the aggregate desire, the dumping of the surplus in export trade, and the Federal Treasury making up the difference between the domestic price and the dumping price.

Other nations have wheat growers, however, and they do not want to have wheat dumped upon them. Already they are threatening retaliation in other commercial ways if we embark on such a plan.

The debenture project is a sure method to embroil us with other nations and to squander our own resources. The conception of conferring upon any group of producers the privilege of producing all they will with the American people as a buyer of all, for that is what it comes to, is economically preposterous. What if that were proposed for copper and petroleum?

Let us consider some simple figures. The consumption of wheat in the United States in the three years 1920-22 was 280.6 lb. per capita; in 1923-25 it was 296.7; in 1926-28 it was 271.2. A bushel of wheat weighs 60 lb., so 271.2 lb. is about 4.5 bushels. The rate of domestic consumption appears to be diminishing. Properly fed persons can not eat more than a certain quantity of food and there is a tendency to change from bread to other foods. With a population approaching 125,000,000 and a personal consumption of 4.5 bushels we get a pretty good measure of the domestic market.

The domestic production of wheat in 1926-28 averaged a little short of 900,000,000 bushels per annum and had a farm value of a little less than a billion dollars, at an average of $1.12 per bushel. The total value of agricultural products has been about 13 billions per annum. The value of the wheat crop is

exceeded by that of the poultry farms; and that of the dairy farms is almost double. The exportation of wheat in 1926-28 averaged about 133,000,000 bushels per annum. In 1929 it was down to 90 millions.

The national income in 1926-28 averaged about 78.5 billion dollars. It will be seen that in that the wheat crop figured to about one-eightieth. That is not a fair comparison, for the basic value of wheat is probably multiplied by a factor of about 3, representing transportation, manufacturing and other service as in the instance of other commodities; so while it may measure the position of the wheat grower himself it does not include the merchants, bankers, etc., who are economically affiliated with him. Anyway it is clear that the wheat growers make an enormous smoke out of a relatively small fire. Why is it that their spokesmen are blind to the effect upon other farmers—the poultrymen and dairy farmers—of enhanced prices for grains? Do not they need some equalization?

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In the Toils of Economics

IT has been a frequent comment of late that sentiment has improved but that actual business volume has shown little change. A year ago a similar hesitancy in the flow of trade was overcome by what proved to be a premature recovery of confidence. With that false start in mind, the average business man has become skeptical of all efforts to revive demand. He has learned that the depression is worldwide, and economists every day bring him further details regarding its extent and gravity. In the face of such sweeping and apparently irresistible forces he sees little chance for individual action. His attitude has become passive, fatalistic.

The very "facts" which a few years ago were hailed as insurance against cyclical swings are now proving the greatest obstacle to cyclical recovery. There is such a thing as knowing too much about a still inexact science. The inanimate economics of prices and production is an interesting and engaging subject, even to the layman, but it has not yet been successfully correlated with the dynamic economics of men and their emotions.

The complex reactions of material and psychological forces are reflected in the current controversy as to whether the world is suffering from overproduction or underconsumption. In the last analysis both viewpoints have much to support them. In the interaction between commodities and mankind, a mounting surplus of goods causes prices finally to fall of their own weight, resulting in a cumulative reluctance on the part of buyers to purchase. When, at length, there is a resumption of buying, underconsumption tends to disappear and overproduction with it. But buying in normal volume will not be resumed so long as fear prevents prospective business from being translated into orders. And that fear has been unduly accentuated by our exaggerated awareness of existing maladjustments.

Isn't it time for a Moses to lead us out of the wilderness of facts and figures, graphs and indexes? Isn't it appropriate to recall that maladjustments have existed even in the most prosperous times and that business recovery can, and in the past has, come in some industries while others remain depressed? Isn't it well to remind ourselves that the mainspring of trade, after all, is initiative on the part of business man and consumer, and that there can be no initiative without courage? The fact that courage was premature a year ago is no proof that it is not needed now.

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The Electrical Industry as a Consumer of Metals

(*Continued from page* 1102)

proved a trying task. When one looks back on the prevailing conditions, the crude annealing furnaces and the little real knowledge possessed by the workers, the excellence of the results obtained is rather remarkable.

Silicon Steel Sheets Developed

About the first of the present century Sir Robert A. Hadfield discovered the beneficial effects of the addition of silicon as an alloying element in the steel for the making of electrical sheets. About 1903 or 1904 silicon sheets began to appear on the market and another period of stress began. When the silicon steel sheets were "right" they were excellent; losses were about one-half those in any sheets previously available, but they frequently were far from right and all sorts of trouble was encountered. Hysteresis was high or sheets were heavily coated with scale which flaked off in punching or handling, or sheets were so brittle that they broke in the punching or in the punchings during assembly or use.

By this time the steel makers had realized that the electrical industry had become one of the major consumers of sheets and had undertaken the study of its needs. They met the immediate handicap of lack of standardized methods of testing. The physicist had means of measuring hysteresis, but they were laborious and time-consuming. The electrical engineers had devised ways of measuring core loss, essentially empirical, and could even separate it into its components, hysteresis and eddy loss. But, as usual, each electrical manufacturing company had worked independently and developed its own methods.

The comparability of the results of any two was not immediately evident, although one in possession of all the details could have found factors which would have reduced them to nearly, if not exactly, a common scale. Some of the electrical instrument makers had turned out very useful apparatus for measuring magnetic characteristics, but no two were alike either in the specimens required or in the actual scale of resulting figures. Obviously neither the steel maker nor anyone else had a table of factors necessary for the reduction of all the different methods to a reasonably common scale.

Again, an A. S. T. M. committee functioned and in time brought order through standardization of methods of testing for permeability and core loss.

MARKETS

Pennsylvania Railroad Awards 125,000 Tons of Structural Steel

FABRICATED Steel Lettings of Past Fortnight Total 321,000 Tons — Steel Ingot Output Recedes to 55 Per Cent —Prices Lose Buoyancy

THE award of 124,900 tons of structural steel work by the Pennsylvania Railroad, less than a fortnight after the placing of 125,000 tons for the Radio City project in New York, has made construction activity the center of interest in the iron and steel market. Including the Pennsylvania letting, fabricating contracts for the week reached the record total of 166,000 tons, forging ahead of the 155,000 tons reported in the previous week.

A large amount of fabricating steel is still pending and many additional structural projects will doubtless mature with the coming of open weather, which is counted on to give impetus to construction work generally, not merely expediting the placing of bridge and building contracts, but hastening the closing of heavy inquiries for line pipe and the launching of extensive highway programs and other public engineering work. Demand for reinforcing steel and road-making equipment is already feeling the stimulus of impending seasonal requirements. Concrete bar awards, at nearly 13,000 tons, are the largest in more than a year.

THE rising importance of construction work as an outlet for tonnage again directs attention to the wave-like character of steel demand since the year opened. Inventory replenishment, together with rail and tin plate tonnage, accounted for most of the improvement in mill operations early in the quarter. Later a fresh stimulus was provided by the growing needs of the automobile industry. In the past week or two specifications from the motor car builders have receded, and the operations of some mills, particularly those making flat-rolled products, have been adversely affected. This setback, however, is not regarded as signifying anything more than exaggerated caution, since April output of motor vehicles for this country and Canada promises to total 330,000 to 350,000 units, as compared with an estimated production of 275,000 to 300,000 in March, and further seasonal gains seem probable in May. The keynote of the situation is that automobile makers are taking nothing for granted, in some cases readjusting factory operations every seven days as reports come in from the retail trade.

CLOSE-RANGE specifying by the motor car industry and irregularities in demands from other sources have resulted in a slight reduction in average raw steel output, ingot production now being estimated at 55 per cent as compared with 57 per cent in the two previous weeks. Chicago, Buffalo, the Wheeling district, Youngstown and Pittsburgh all reported declines, most of them small.

The price situation shows signs of clarifying. Sheets have achieved more stability, following the placing of second quarter contracts at rather sharp concessions in one or two finishes. Weakness persists in black sheets, which are rather generally available at 2.25c., Pittsburgh, with as low as 2.20c. reported in some instances. The recently announced advances on strip steel have been withdrawn. The outcome of the advance on plates, shapes and bars is in doubt. In some cases consumers are specifying fully against contracts for the first quarter entered at 1.60c., Pittsburgh, but there has been no rush to place second quarter contracts at 1.65c. and the advance to 1.70c. scheduled to become effective on April 1 has not been taken seriously.

PIG iron demand is listless and increase in melt has been confined mainly to automobile foundries. March shipments of iron to the motor car industry were 15 to 20 per cent above those of February. Pig iron prices are highly sensitive and recent advances in quotations at Pittsburgh and at Birmingham for Northern delivery are largely untested.

The scrap market is moving aimlessly, with demand light and prices weaker in tone.

THE IRON AGE composite prices are unchanged. Finished steel, at 2.128c. a lb., is $4.72 a net ton lower than a year ago. Pig iron, at $15.71 a gross ton, is $2.04 below the level of 12 months ago. Steel scrap, at $11.08 a gross ton, is off $3.50 compared with a year ago.

PITTSBURGH — Steel Demand Curtailed, But Revival Is Expected by Mid-April

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Buying lull in steel brings slight reduction in ingot output in Pittsburgh and nearby districts.

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Falling off is attributed mostly to smaller orders from the automobile industry.

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Demands resulting from construction work and other outdoor activities expected to bring resumption of uptrend by mid-April.

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Sheet and strip prices more stable following recent weakness, but advance on heavy hot-rolled products is still to be tested.

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Scrap market very dull, with no important price changes.

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PITTSBURGH, March 31. — The check in releases for finished steel products reported by local mills about the middle of the month seems to have developed into a noticeable curtailment in demand during the last week. Makers of practically all the leading products report specifications in the last half of the month as having been somewhat lighter than they were in the first two weeks, and indicated gains over February, which formerly seemed quite apparent, have been sharply reduced. Nevertheless, tonnage ordered out late in February and early in March has served to bring about a much more encouraging gain in shipments in March as compared with the preceding month.

The automobile industry, which dominated the upward trend in orders a month or six weeks ago, has been the principal factor in the recent curtailment, but retrenchment in this direction is soon expected to be offset by heavier specifications for the steel products which are most benefited by open weather. For this reason, it is not unreasonable to expect an upward turn in aggregate releases about the middle of April, which will be prompted by increased activity in heavy construction work, rail-laying programs, road work and related lines, and will serve to stimulate the steel industry in about the same way that improved releases from the automobile makers did in February.

The recent lull in buying has also served to emphasize the existence of the mixed tendencies in demand for steel products which have made themselves felt thus far in the year.

Steel ingot output in the Pittsburgh district is holding at 50 per cent of capacity, a shade below that of last week. In the Wheeling district production has dropped to about 60 per cent, and schedules in the Valleys have declined several points to less than 50 per cent. These losses are the direct result of reduced automobile requirements and reflect the lower rate of sheet and strip operations in the districts affected. Tin plate production, on the other hand, is well sustained at 80 per cent of capacity, and production of the heavy rolled products is holding, if it has not broadened, particularly in the case of reinforcing bars.

Prices on flat-rolled steel products have achieved more stability, following the placing of second quarter contract tonnage at lower levels in some cases than those of the first quarter. Efforts of leading producers to raise the price on bars, plates and shapes from 1.60c., Pittsburgh, the level which ruled largely on first quarter shipments, to 1.65c. are meeting with determined consumer opposition, but have been successful in a measure in the case of bars. The possibility of a further advance after April 1 is not taken very seriously by the buyers, but has undoubtedly driven in some contracts at 1.65c. Consumers of wire products have been able to contract at the old prices, but recent advanced figures will be quoted on new business hereafter. Strip makers have abandoned their efforts to raise prices, while sheet producers have had difficulty in maintaining recent minimum figures.

PIG IRON

New buying is still at a low rate. Consumers have not wavered from their practice of ordering out small tonnages for immediate shipments when needed. The foundries of the heavier machinery makers are much the busiest in the district, with jobbing plants and radiator and sanitary ware producers running at a very low rate. While shipments in March were ahead of those of February, the gain was not impressive enough to be considered even seasonal. Prices are unchanged, with insufficient buying reported to test the higher asking prices on foundry iron named recently by one producer.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$16.50 to $17.00
Bessemer	17.00
Gray forge	16.00 to 16.50
No. 2 foundry	16.50 to 17.00
No. 3 foundry	16.00 to 16.50
Malleable	17.00
Low phos., copper free	26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton f.o.b. Pittsburgh district furnace:

Basic	$17.00 to $17.50
No. 2 foundry	17.00 to 17.50
No. 3 foundry	16.50 to 17.00
Malleable	17.50
Bessemer	17.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

SEMI-FINISHED STEEL

Shipments during March were considerably ahead of those of February because of the higher mill operations of non-integrated makers of strips and tin plate. New buying of billets, slabs and sheet bars is negligible, with prices still unchanged at $30, Pittsburgh or Youngstown. Makers of forging billets have taken some business at $36, Pittsburgh. The market on wire rods still lacks a definite test. Some users have been able to extend old contracts at $35, Pittsburgh, into the second quarter, but makers are still trying to get $37.

RAILS AND TRACK ACCESSORIES

Specifications are coming in at a good rate, and mill operations on both rails and accessories are still gaining. A small amount of inquiry for second quarter needs is in the market, but most of it is of routine character. The New York, New Haven & Hartford is in the market for 1000 kegs of spikes.

BARS, PLATES AND SHAPES

The market on the heavy hot-rolled products continues rather dull in this district. Despite talk of increased prices, consumers are not showing much interest in forward buying. The end of the quarter brought some increase in specifications against old contracts, but not so much as might be expected in view of recently announced higher asking prices. Reinforcing bars have been somewhat more active, and total shipments during the first quarter have not fallen much behind those of the corresponding period last year. The Pennsylvania Railroad has not yet taken action against its inquiry for 8500 tons of reinforcing bars, but the material required for the Pittsburgh Post Office foundations, totaling 820 tons, has been placed. Not much new work is coming out in this district, although Allegheny County is expected to make formal inquiry for 2000 tons of shapes for a highway bridge at Boston, Pa., in the next few days. No barge business of importance has been reported in the last week, but considerable miscellaneous inquiry is still in the market. Except for the barge builders, users of plates are taking little material, but improved demand is reported by one or two of the tank fabricators.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

	Mar. 31, 1931	Mar. 24 1931	Mar. 3 1931	Apr.1, 1930
Pig Iron, Per Gross Ton:				
No. 2 fdy., Philadelphia	$17.76	$17.76	$17.76	$20.26
No. 2, Valley furnace	16.50	16.50	16.50	18.50
No. 2 Southern, Cin'ti	14.19	14.19	14.19	16.69
No. 2, Birmingham	12.00	12.00	13.00	14.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	19.50
Basic, del'd eastern Pa.	17.25	17.25	17.25	19.00
Basic, Valley furnace	16.50	16.50	16.50	18.50
Valley Bessemer, del'd P'gh.	18.76	18.76	18.76	20.76
Malleable, Chicago*	17.50	17.50	17.50	19.50
Malleable, Valley	17.00	17.00	17.00	19.00
L. S. charcoal, Chicago	25.04	25.04	27.04	27.04
Ferromanganese, seaboard	80.00	80.00	80.00	94.00
Rails, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	30.00	30.00	30.00	33.00
Sheet bars, Pittsburgh	30.00	30.00	30.00	33.00
Slabs, Pittsburgh	30.00	30.00	30.00	33.00
Forging billets, Pittsburgh	36.00	36.00	36.00	38.00
Wire rods, Pittsburgh	35.00	35.00	35.00	38.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	**1.65**	1.60	1.60	1.85
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.65	1.65	1.65	1.80
Bars, Chicago	1.70	1.70	1.70	1.95
Bars, Cleveland	1.70	1.70	1.70	1.85
Bars, New York	1.98	1.98	1.98	2.14
Tank plates, Pittsburgh	1.65	1.65	1.65	1.80
Tank plates, Chicago	1.70	1.70	1.70	1.90
Tank plates, New York	1.93	1.93	1.93	2.07½
Structural shapes, Pittsburgh	1.65	1.65	1.65	1.80
Structural shapes, Chicago	1.70	1.70	1.70	1.90
Structural shapes, New York	1.90½	1.90¼	1.90½	2.04¼
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh	1.55	1.55	1.55	1.70
Cold-rolled strips, Pittsburgh	2.25	2.25	2.25	2.55

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

	Mar.31, 1931	Mar.24, 1931	Mar.3, 1931	Apr.1, 1930
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.25	2.25	2.35	2.55
Sheets, black, No. 24, Chicago dist. mill	2.35	2.35	2.45	2.65
Sheets, galv., No. 24, P'gh	2.90	2.90	2.90	3.30
Sheets, galv., No. 24, Chicago dist. mill	3.00	3.00	3.00	3.40
Sheets, blue, No. 13, P'gh	2.05	2.05	2.05	2.25
Sheets, blue, No. 13, Chicago dist. mill	2.15	2.15	2.15	2.35
Wire nails, Pittsburgh	1.90	1.90	1.90	2.20
Wire nails, Chicago dist. mill	1.95	1.95	1.95	2.35
Plain wire, Pittsburgh	2.20	2.20	2.20	2.40
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.45
Barbed wire, galv., Pittsburgh	2.55	2.55	2.55	2.95
Barbed wire, galv., Chicago dist. mill	2.60	2.60	2.60	3.00
Tin plate, 100-lb. box, P'gh	$5.00	$5.00	$5.00	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$12.75	$12.75	$13.00	$16.25
Heavy melting steel, Phila.	10.50	10.50	10.50	14.50
Heavy melting steel, Ch'go	10.00	10.00	10.00	13.00
Carwheels, Chicago	9.50	9.50	10.50	14.50
Carwheels, Philadelphia	*13.00*	13.50	13.50	15.00
No. 1 cast, Pittsburgh	12.50	12.50	12.50	14.50
No. 1 cast, Philadelphia	11.50	11.50	11.50	15.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	9.50	13.75
No. 1 RR. wrot, Phila.	12.00	12.00	12.00	15.00
No. 1 RR. wrot., Ch'go (net)	8.25	8.25	8.00	12.25
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.50	$2.60
Foundry coke, prompt	3.50	3.50	3.50	3.50
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	10.12½	10.12½	10.62½	18.12½
Electrolytic copper, refinery	*9.50*	9.75	10.25	17.75
Tin (Straits), New York	*26.75*	26.90	26.75	36.75
Zinc, East St. Louis	*3.95*	4.00	4.05	4.82½
Zinc, New York	*4.00*	4.35	4.40	5.17½
Lead, St. Louis	4.25	4.25	4.35	5.60
Lead, New York	4.50	4.50	4.60	5.75
Antimony (Asiatic), N. Y.	7.00	7.25	7.00	8.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

The price situation is clouded, with shading of the 1.65c., Pittsburgh, price in certain competitive territories. In the Detroit and Cleveland districts, mills are experiencing difficulty in establishing a higher price on bars for second quarter, and occasional orders for shapes are bringing out quotations of 1.60c. or less. The 1.70c., Pittsburgh, price on bars, plates and shapes announced recently to become effective on April 1 does not seem to be regarded very seriously by the trade, which is more interested in the attempts of makers to establish the market at 1.65c.

COLD-FINISHED BARS

Despite declines in releases during the last week or two, specifications in March exceeded those of February with a number of makers. Nevertheless, current demand does not justify an operation of more than 40 per cent, and activity has recently declined almost to 35 per cent. Business from sources other than the automobile industry is very light, but the price is being fairly well maintained at 2.10c., Pittsburgh, except in the Detroit area.

SHEETS

Demand during the last week has been hesitant, with only one or two of the leading consuming industries increasing their requirements. Releases from automobile makers were generally lighter, and miscellaneous demand barely held its own. Makers of galvanized stock report considerably better business, and slight gains are reported by producers of metal lath and other sheet steel building products.

Operations this week are lower, and the average for the industry is less than 45 per cent of capacity. Production of the leading interest is holding its own at about 40 per cent.

Prices seem to have achieved some stability, with second quarter contracting largely completed. The sharp concessions which were made to get second quarter business will not likely be repeated for some time to come, as little desirable tonnage is now coming into the market. No further declines in prices have been reported, and quotations are fairly well maintained at 2.25c. on black sheets, 2.90c. on galvanized, 2.05c. on blue annealed, 1.90c. on light plates, and 3.20c. on auto body sheets. Shading of quotations on galvanized material has thus far been confined principally to jobbers, and is most common in the South and East.

TUBULAR GOODS

A large maker of oil country tubular goods has reduced prices on drill pipe and casing by increasing the discount on carload lots from 10 and 5 to 10 and 10 off list. Other mills will likely adopt the same schedules. Oil country demand is still rather light, and the price change is not expected to develop much new business. Line pipe activity has also been lacking in the last week, with no action reported on any of the large inquiries before the trade. The approach of open weather is expected to hasten some of these projects, and most of the lines under contemplation can hardly be delayed longer than April. Mechanical tubing is rather active as compared with other types of pipe. Butt-weld material continues very dull. Pipe mill operations have not changed in the last week, and only the units

THE IRON AGE COMPOSITE PRICES

	Finished Steel	Pig Iron	Steel Scrap
March 31, 1931	2.128c. a Lb.	$15.71 a Gross Ton	$11.08 a Gross Ton
One week ago	2.128c.	15.71	11.08
One month ago	2.142c.	15.71	11.17
One year ago	2.264c.	17.75	14.58
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1931	2.142c., Jan. 13;	2.121c., Jan. 6	$15.90, Jan. 6;	$15.71, Feb. 17	$11.33, Jan. 6;	$11.08, Feb. 17
1930	2.362c., Jan. 7;	2.121c., Dec. 9	18.21, Jan. 7;	15.90, Dec. 16	15.00, Feb. 18;	11.25, Dec. 9
1929	2.412c., April 2;	2.362c., Oct. 29	18.71, May 14;	18.21, Dec. 17	17.58, Jan. 29;	14.08, Dec. 3
1928	2.391c., Dec. 11;	2.314c., Jan. 3	18.59, Nov. 27;	17.04, July 24	16.50, Dec. 31;	13.08, July 2
1927	2.453c., Jan. 4;	2.293c., Oct. 25	19.71, Jan. 4;	17.54, Nov. 1	15.25, Jan. 11;	13.08, Nov. 22
1926	2.453c., Jan. 5;	2.403c., May 18	21.54, Jan. 5;	19.46, July 13	17.25, Jan. 5;	14.00, June 1
1925	2.560c., Jan. 6;	2.396c., Aug. 18	22.50, Jan. 13;	18.96, July 7	20.83, Jan. 13;	15.08, May 5

engaged on large line pipe jobs are more than 35 per cent active. Production of lapweld pipe is even lower.

TIN PLATE

Operations in this industry have been maintained during the past week, with no impressive gains reported. Mills are engaged at about 80 per cent of capacity, with the leading interest running at 75 per cent, and some of the larger independents scheduled full.

STRIP STEEL

Makers of hot and cold-rolled strip have generally discarded their attempt to raise prices at this time, and the market is again quoted at 1.55c., Pittsburgh, on hot-rolled material 6 in. and wider, 1.65c. on the narrower widths, and 2.25c. on cold-rolled. Second quarter business was generally written at these levels, and makers have readjusted contracts closed at higher prices. Cooperage stock is also lower, with mills in this district quoting as low as 1.70c. Specifications for strip steel were lighter last week, and business during the last two weeks of March has been considerably under that of the first half of the month. Nevertheless, aggregate shipments will show a fair gain over those of February. Miscellaneous demand for strip is holding up, and declines in tonnage can usually be attributed to the automobile industry. Mill operations are lower at 55 per cent of capacity on hot-rolled material, and about 35 per cent on cold-rolled.

WIRE PRODUCTS

Specifications were a little higher last week, having come principally from users wishing to complete shipments against low-priced contracts. In some cases, however, contracts have been extended into the second quarter at unchanged prices, and the higher asking figures named a short time ago have affected only very small users. Demand from the jobbing trade in the South and West is a little heavier, but is not sufficient in total volume to make much change in production. Manufacturers' wire is quoted at 2.30c., Pittsburgh, and nails at $2 a keg for the second quarter, but these prices have not yet been tested.

WAREHOUSE BUSINESS

Prices on the heavier products are fairly well maintained, but sheets are weak and galvanized material has been reduced to 3.60c. a lb. for the No. 24 gage in lots of 25 or more bundles.

COKE

The coke market continues very dull, with prices weak, particularly on the furnace grade. Some sellers are willing to take forward contracts for the furnace grade at as low as $2.50, Connellsville, and the spot market is correspondingly weaker. Little change is reported in foundry coke, and shipments this month showed scarcely any improvement over those of February.

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.75c.
Reinforcing steel bars	2.75c.
Cold finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.60c.
Light plates, blue annealed (No. 10)	2.75c. to 3.00c.
Blue annealed sheets (No. 13)	2.90c. to 3.05c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	3.82c.
Spikes, large	2.65c.
Small	2.90c. to 3.05c.
Boat	3.15c.
Track bolts, all sizes, per 100 count,	60 and 10 per cent off list
Machine bolts, 100 count,	60 and 10 per cent off list
Carriage bolts, 100 count,	60 and 10 per cent off list
Nuts, all styles, 100 count,	60 and 10 per cent off list
Large rivets, base per 100 lb.	$3.30
Wire, black, soft ann'Ed, base per 100 lb.	2.40
Wire, galv. soft, base per 100 lb.	2.85
Common wire nails, per keg, $2.10 to	2.15
Cement coated nails, per keg	2.15

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 2999 lb.

OLD MATERIAL

The scrap market has been particularly dull in the last week, with no consumer buying of the heavier grades reported. While one mill is reported to have paid $9 for machine shop turnings, it is asking for material entirely free of alloys, and ordinary turnings previously acceptable are being rejected. While this policy is said to be experimental, it offers recognition of the growing amount of alloy steel scrap now coming into the market, with the possibility of more rigid inspection and necessary segregation of material in the future. A few grades of scrap are quotably lower, and the market has a weak undertone. Dealers will await with interest the disposition of the Pennsylvania Railroad list, on which bids are being taken April 1. The Baltimore & Ohio will take bids April 6 on 6400 tons of scrap. In the meantime, the Erie is expected to offer again its accumulated surplus.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$12.50 to $13.00
No. 2 heavy melting steel	11.00 to 11.50
Scrap rails	12.50 to 13.00
Compressed sheet steel	12.50 to 13.00
Bundled sheets, sides and ends	11.00 to 11.50
Cast iron carwheels	13.50 to 14.00
Sheet bar crops, ordinary	14.00 to 14.50
Heavy breakable cast	10.00 to 10.50
No. 2 railroad wrought	12.50 to 13.00
Hvy. steel axle turnings	11.00 to 11.50
Machine shop turnings	8.00 to 8.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	16.00 to 16.50
Railr. coil and leaf springs	16.00 to 16.50
Rolled steel wheels	16.00 to 16.50
Low phos. billet and bloom ends	18.00 to 18.50
Low phos. mill plates	15.00 to 16.00
Low phos. light grades	15.00 to 16.00
Low phos. sheet bar crops	16.50 to 17.00
Heavy steel axle turnings	11.00 to 11.50
Electric Furnace Grades:	
Low phos. punchings	15.00 to 16.00
Heavy steel axle turnings	11.00 to 11.50
Blast Furnace Grades:	
Short shoveling steel turnings	8.00 to 8.50
Short mixed borings and turnings	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Rolling Mill Grades:	
Steel car axles	18.00 to 18.50
Cupola Grades:	
No. 1 cast	12.00 to 13.00
Rails 3 ft. and under	14.00 to 14.50

CHICAGO

Lull in Steel Orders Brings Reduction in Ingot Output to 58 Per Cent

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CHICAGO, March 31.—The closing days of March have brought a lull in the local iron and steel market. Operations, which are subject to frequent though not very wide fluctuations, have dropped several points, ingot production now being at 58 per cent of capacity. New buying, which some had expected to be stimulated by recent price announcements, is still decidedly on a hand-to-mouth basis, and the aggregate is showing little change from week to week. In fact, it is quite evident that consumers are not yet ready to consider future commitments, probably for the reason that their business, if increasing at all, is doing so slowly and because close range buying is not confined to the steel market.

The strength of the situation, as it pertains to specifications, lies in the fact that there is a comparatively uniform demand for most steel mill products. Bookings of hot-rolled strip are larger, and schedules are rather promising for the next six weeks to two months. Rail releases are practically stationary, but the accessory tonnage is moving upward. Plate mill schedules are getting the bulk of their support from line pipe manufacture, though use of plates in bridges and building work is expanding. The Western Pipe & Steel Co. has taken an order for 40,000 lineal ft. of steel pipe for Los Angeles. Fabricators are doing more estimating on small public work, but this encouraging note is offset by new low prices for fabricated material.

The price situation is the most disturbing element in today's market. The move to quote 1.80c. a lb., Chicago, on plates, shapes and bars is not wholly accepted by producers in this district. Quotations on billets are off $1, and the sheet market is weak in outlying districts.

The scrap market is moving aimlessly, with a weaker tone apparent.

FERROALLOYS

Spot sales are almost wholly absent from this market. Shipments to steel mills are holding up well.

COKE

By-product foundry coke is moving steadily, and the price is unchanged at $8 a ton, local ovens. Domestic coke is off $1 a ton to $5.75 a ton, delivered Chicago.

PIG IRON

Forward contracting has not made the progress that the trade has expected. Most consumers prefer to make commitments only for such tonnages as they figure they can use in the near future. This gives the whole market the characteristic of spottiness. Navigation officially opens April 15, but as yet little is heard of boat movements of pig iron. Northern iron is holding at $17.50, local furnace. Recent quotations on Southern iron are at $11 a ton, Birmingham.

Ingot production in Chicago district drops to 58 per cent of capacity, following lull in steel buying.

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Price advances, instead of stimulating buying, have apparently caused a halt.

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Consumers still buying on a hand-to-mouth basis though use of steel remains fairly steady.

* * *

Pig iron contracting not making the progress expected.

* * *

Scrap market is moving aimlessly, with no strength yet apparent.

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Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil 1.50	$25.04 to 27.04
S'th'n No. 2 fdy.	17.01
Low phos., sil. 1 to 2, copper free	28.50 to 29.20
Silvery, sil. 8 per cent	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

WIRE AND WIRE PRODUCTS

April will open with little change in the Western wire market. Prices are on a better footing than earlier in the year, but most of the bookings are for spot delivery. Demand from jobbers is showing little variation, losses in some directions being offset by gains elsewhere. Business is opening up slowly in the Northwest, which is a district normally backward because of the comparatively late arrival of spring weather. Recent specifications from the manufacturing trade are a trifle heavier. Automobile production appears to be gaining slowly. Sentiment in this industry seems to lead to the belief that April output will top that of March and that May will prove to be the best month in the first half of the year. Well distributed snows and rains throughout the Central West have effectively relieved a threatened shortage of soil moisture, and crop prospects are generally improved. It is still too early to gage the effect of this favorable development.

RAILS AND TRACK SUPPLIES

This market is quiet except in track accessories, of which fully 3000 tons have recently been ordered. Production schedules on these commodities have slowly been gaining headway, and new releases point to additional moderate gains. There is little that can be said concerning rails except that specifications are steady and output is well supported in the range from 50 to 55 per cent of capacity. An encouraging feature of the market is that railroads which have not bought for 1931 are not hesitant in making releases against tonnages carried over from last year. Some of these railroads are making preliminary estimates of additional needs, thereby giving support to the contention of sellers that a secondary buying movement is in the offing.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

BILLETS

Rerolling billets, 4 in. and under 10 in., are being quoted at $31 to $32 a ton, Chicago. Forging quality billets are priced at $36. Current demand is light and forward buying is dull.

BOLTS, NUTS AND RIVETS

Orders for these products in March show a slight drop from the total in February, but shipments in the month are a trifle ahead of deliveries in February. The reduction in orders results almost wholly from curtailment of output by farm implement manufacturers and builders of tractors. Forward contracting is practically at an end. Prices are steady.

SHEETS

Use of sheets has steadied at a fair demand, which is supporting output in the range from 68 to 70 per cent of capacity. Buying is still of a spotty character, very few second quarter contracts having been entered in producers' books. Locally, prices are holding well, but to the east, principally at Detroit, quotations are variable and concessions are common. Competition of this kind is found here and there in this district, but attempts to move tonnages west to Chicago

against existing freight rates are not altogether attractive. The use of galvanized sheets remains in fair volume, but below seasonal expectations. The heaviest movement is in black sheets going to the general manufacturing trade. Deliveries are all prompt, with roofing sheets to be had from stocks.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.40c. to 2.50c.; No. 24 galv., 3.05c. to 3.15c.; No. 10 blue ann'l'd, 2.05c. to 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

CAST IRON PIPE

Recent days have brought several sizable orders and some attractive inquiries. James B. Clow & Sons have taken 1775 tons of pipe, much of which is special, for the Sanitary District, Chicago, and 250 tons of 4 to 14-in. pipe for Rhinelander, Wis. Chicago has placed 3700 tons, the 6-in. having been taken by the Alabama Pipe Co., the 12-in. by the Lynchburg Foundry Co., and the 2000 tons of 8-in. by the Glamorgan Pipe & Foundry Co. The quotation on the 8-in. was $40 a ton, delivered Chicago, or $32, Birmingham. The United States Pipe & Foundry Co. bid $38.40 a ton, delivered, or $30, Birmingham, and was successful bidder on 6000 tons of 20 to 54-in. pipe at Milwaukee. Fresh inquiries come from Detroit for 2400 tons of 12-in., from Chicago for 500 tons of 20-in., and from Oakfield, Wis., for 18,000 ft. of 6 to 20-in. Competition for large tonnages is unusually keen, especially when sizes fit the needs of foundry schedules. Very heavy tonnages bring out prices of $30 to $32 a ton, Birmingham, and medium-sized tonnages are quoted at $35.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $43 to $44; 4-in., $46 to $47; Class A and gas pipe, $3 extra.

PLATES

The local plate market has turned quiet, except for new orders to be used in bridge and building work. The tank market is listless, and railroad equipment is giving virtually no support to rolling schedules. In fact, the backbone of mill operations is formed by releases for line pipe manufacture. Sellers are still awaiting orders for the steel for underframes and car parts that are to be delivered to the Great Northern.

BARS

New buying of mild steel bars is showing little variation, but specifications continue to creep up. Agricultural implement manufacturers are losing ground, as gaged by production schedules, while builders of road machinery remain busy, with satisfactory programs for the near future. Heavy excavating machinery builders are looking forward to orders for equipment in connection with the Federal Government's program along the Mississippi River.

Specifications for alloy steel bars are steady, and output remains at 50 per cent of capacity. Use by the automobile industry continues to gain. The bar iron market is quiet. Local rail steel bar mills are reverting to double turn operation, and production on this basis ranges from 60 to 70 per cent of capacity. Producers have not yet formulated plans for prices to be effective after April 1.

STRUCTURAL MATERIAL

New awards total about 3000 tons, the bulk of which is for highway bridge work in the Central West and Mountain States. Inquiries, including 3500 tons for a hotel in Oklahoma, reach 6000 tons. There is more estimating of new projects, but as a general thing individual inquiries are small. Of interest to Chicago fabricators is word that a building permit has been granted for the Field Estate Building, which will require a heavy tonnage of steel.

REINFORCING BARS

Small orders and the beginning of work on road programs have been effective in raising bending shop output to slightly better than 50 per cent of capacity. Highway tonnage forms a large part of the bars moving through fabricators' hands. This particular type of work requires little in the way of labor hours, and therefore it moves rapidly through shops. The contractor for the Stickney, Ill., sewage treating plant has arranged for 5000 tons of reinforcing bars. Illinois will take bids April 14 on more road work and Indiana will need steel for its program. Approximately 2000 miles of new roads are being planned in Louisiana. The actual price structure in this market remains somewhat in doubt in the absence of new tonnage of the size to afford tests.

OLD MATERIAL

Prices are definitely lower on many specialties and the low phosphorus grades. Orders for these grades are scarce and available supplies are slowly increasing. The best recent offer on couplers is $11.50 a gross ton, delivered, a drop of $1 since the last purchase. No buyers of electric furnace grade of axle turnings have appeared recently, and dealers are diverting tonnages appearing on tracks to local steel mills to be used in open-hearth furnaces. It is not clear what effect recent price changes will have on the list as a whole. Heavy melting steel is still quotable at $10.25 a gross ton, delivered, but support of this price seems to be weakening. Bidding on 2000 tons offered by the Santa Fe brought a price equivalent to $10.50 a gross ton, delivered consumer's yard. This might reflect strength were it not for the fact that consumption is no longer gaining, and much of this tonnage is ready to come on track in the near future. Spring weather is tending to speed movement of scrap from all directions, and it is reasonable to assume that tonnages held for a higher market may be dumped should the list develop further weakness.

Prices deliv'd Chicago district consumers:

	Per Gross Ton	
Basic Open-Hearth Grades:		
Heavy melting steel	$9.75 to	$10.25
Shoveling steel	9.75 to	10.25
Frogs, switches and guards, cut apart, and misc. rails	9.75 to	10.25
Factory hyd. comp. sheets	8.00 to	8.50
Drop forge flashings	6.75 to	7.25
No. 1 busheling	8.25 to	8.75
Forg'd cast and r'l'd steel carwheels	12.50 to	13.00
Railroad tires, charg. box size	12.50 to	13.00
Railroad leaf springs cut apart	12.25 to	12.75
Axle turnings	8.50 to	9.00
Acid Open-Hearth Grades:		
Steel couplers and knuckles	11.00 to	11.50
Coil springs	12.50 to	13.00
Electric Furnace Grades:		
Axle turnings	8.75 to	9.25
Low phos. punchings	11.00 to	11.50
Low phos. plates, 12 in. and under	11.25 to	11.75
Blast Furnace Grades:		
Cast iron borings	4.75 to	5.00
Short shoveling turnings	4.50 to	5.00
Machine shop turnings	4.50 to	5.00
Rolling Mill Grades:		
Rerolling rails	12.00 to	12.50
Cupola Grades:		
Steel rails, less than 3 ft.	11.50 to	12.00
Steel rails, less than 2 ft.	12.50 to	13.00
Angle bars, steel	11.00 to	11.50
Cast iron carwheels	9.50 to	10.00
Malleable Grades:		
Railroad	11.50 to	12.00
Agricultural	10.75 to	11.00
Miscellaneous:		
*Relaying rails, 56 to 60 lb.	19.00 to	21.00
*Relaying rails, 65 lb. and heavier	22.00 to	27.00
	Per Net Ton	
Rolling Mill Grades:		
Iron angle and splice bars	9.75 to	10.25
Iron arch bars, and transoms	10.50 to	11.00
Iron car axles	18.00 to	19.00
Steel car axles	12.75 to	13.25
No. 1 railroad wrought	8.25 to	8.75
No. 2 railroad wrought	8.75 to	9.25
No. 1 busheling	6.00 to	6.50
No. 2 busheling	4.00 to	4.50
Locomotive tires, smooth	11.50 to	12.50
Pipes and flues	5.50 to	6.00
Cupola Grades:		
No. 1 machinery cast	9.50 to	10.00
No. 1 railroad cast	8.50 to	9.00
No. 1 agricultural cast	8.00 to	8.50
Stove plate	7.25 to	7.75
Grate bars	7.00 to	7.50
Brake shoes	7.75 to	8.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.90c.
Reinforcing bars, billet steel	2.00c.
Rail steel reinforcement	1.50c. to 1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.35c.
Flats and squares	3.85c.
Bands, ⅞ in. (in Nos. 10 and 12 gages)	3.10c.
Hoops (No. 14 gage and lighter)	3.65c.
Black sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes (⅜ in. and larger)	3.45c.
Track bolts	4.30c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60 and 10
Carriage bolts	60 and 10
Coach and lag screws	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

CLEVELAND

Indications Point to Continued Gradual Uptrend During April

CLEVELAND, March 31.—The steel industry will start the second quarter in a considerably more favorable condition than at the beginning of the present quarter. March has shown a moderate gain in business over the preceding month, and February was better than January. Indications are that the slow uptrend will continue during April.

While business has become more diversified, the improvement has come largely from the motor car industry. Automobile production schedules for April are somewhat larger than for March.

The Republic Steel Corpn. on April 1 will place in operation two open-hearth furnaces at its Bourne-Fuller plant, which has been idle for many months. Another Cleveland steel plant shut down two open-hearth furnaces this week, so that local operations are unchanged at 67 per cent.

Orders for bars, plates and shapes gained the past week, but part of the increase can be attributed to tonnage that was brought out by the $1 a ton price advance, specifications being accepted against the old 1.60c. contracts up to April 1. Consumers as a rule were not induced by the price advance to order steel beyond their early needs. Demand for sheets and strip steel, while holding to recent volume, has not increased the past week or two. There has been a moderate amount of contracting for the second quarter in steel bars, plates and shapes. However, the announcement of most mills that another $1 a ton advance to the Pittsburgh base will apply on business not covered by 1.65c. contracts placed before April 1 has not resulted in any general rush to cover, and some feel that the principal effect of the higher asking price will be to strengthen the 1.65c. price. Quite a few consumers have placed bar contracts at 1.70c., Cleveland, for the coming quarter and this apparently will be the ruling price for the present for consumers not under contract. Hot and cold-rolled strip have settled back to the first quarter prices except for small lots. Sheet prices are somewhat irregular.

PIG IRON

Sales gained slightly the past week. March made a better showing than February in that shipments were 10 to 15 per cent larger. However, sales for the month were considerably below those of the previous month. The improved demand from the motor car industry is being maintained, but orders from other sources are spotty. Some jobbing foundries are operating better than a few weeks ago, but others have very little business. Foundries are keeping their stocks low and buying from hand to mouth. As consumers bought cautiously for the first quarter, the amount of iron to be carried over to the second quarter is not in excess of the normal carryover. While the market lacks strength, prices are steady at $16 to $17, Lake furnace, for foundry and malleable iron except in Indiana and Michigan, where $17 to $17.50 prevails. For Cleveland delivery, local producers quote $17, furnace.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$17.00
S'th'n fdy., sil. 1.75 to 2.25	$16.51 to 17.01
Malleable	17.50
Ohio silvery, 8 per cent	25.00
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

IRON ORE

Many underground mines in the Lake Superior district are being shut down because of the poor outlook for ore this year. While these mines did not operate at maximum capacity during the winter, some have accumulated larger stocks than they may be able to move during the coming season. Establishment of prices and opening of the market is expected next week.

SHEETS

Specifications are holding to recent volume, but very little interest is being shown in second quarter contracts and few have been closed. The Fisher Body Corpn. released several thousand tons during the week for its Chevrolet body plant in Cleveland, covering its requirements until about May 15. The tonnage was about the same as the last release, indicating no expected change in present production schedules. Black sheet prices are still represented by a spread of 2.25c. to 2.35c., with the lower price more in evidence for large consumers. Concessions on this grade have affected steel furniture sheets, which are figured on a black sheet base, and these now range from 3.50c. to 3.60c. While there are reports of shading of galvanized sheets to 2.80c. in some sections, the 2.90c. price appears to be holding in this territory.

STRIP STEEL

Most of the larger consumers in the automotive field have closed second quarter contracts at 1.55c., Pittsburgh, for wide hot-rolled strip and at 1.65c. for narrow, but mills are still asking $1 a ton higher from the smaller consumers. Contracting in this territory has been light. Attempts to put cold-rolled strip on a $2 a ton higher base have also failed, and this product is being quoted to larger consumers at 2.25c., Cleveland, for the second quarter. The $2 a ton differential for small consumers is being maintained. Hot-rolled strip specifications from the motor car industry continue good, although some shipments have been held up by automobile parts makers.

BOLTS, NUTS AND RIVETS

Orders for bolts and nuts have come out slightly better the past week or two, and makers report a gain of 15 to 20 per cent in volume of business during March over February. Demand for rivets is very slow, having shown no gain in recent weeks.

BARS, PLATES AND SHAPES

Steel bars are in fair demand, with business coming mostly from the motor car industry. Alloy steel bars are moving moderately well. Inquiry is out for 1300 tons of reinforcing bars for the Cincinnati Union Terminal project. Plate orders are more numerous but small. Structural inquiry shows a slight improvement.

WIRE PRODUCTS

Orders have been stimulated somewhat by expiring first quarter contracts carrying prices $2 a ton below those now quoted. While a few small contracts have been placed at the advance, large consumers and jobbers are hesitant about placing contracts and the higher prices have not been tested.

OLD MATERIAL

The market shows no change in volume of business or in prices. Consumer buying is lacking. Dealers are buying small lots of scrap for shipment against contracts, with the district mills paying $11.75 to $12 for No. 1 heavy melting steel, $10.25 to $10.50 for No. 2, and $10.75 to $11 for No. 1.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$10.00 to $10.50
No. 2 heavy melting steel	9.75 to 10.00
Compressed sheet steel	9.25 to 9.50
Light bundled sheet stampings	7.50 to 7.75
Drop forge flashings	8.00 to 8.50
Machine shop turnings	5.00 to 5.50
Short shoveling turnings	7.00 to 7.25
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	10.00 to 10.50
No. 1 busheling	8.50 to 9.00
Pipes and flues	5.50 to 6.00
Steel axle turnings	9.50 to 10.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops	16.50 to 17.00
Blast Furnace Grades:	
Cast iron borings	7.00 to 7.50
Mixed borings and short turnings	7.00 to 7.50
No. 2 busheling	6.25 to 6.50
Cupola Grades:	
No. 1 cast	12.00 to 12.50
Railroad grate bars	6.00 to 6.50
Stove plate	6.00 to 6.50
Rails under 3 ft	15.00 to 15.50
Miscellaneous:	
Rails for rolling	15.00 to 15.50
Railroad malleable	12.50 to 13.00

NEW YORK Sharper Competition in Pig Iron—Steel Buying Falls Off

NEW YORK, March 31.—Competition in the pig iron market has been sharpened as a consequence of the expected blowing in of a Northern furnace and the impending opening of the season of navigation on the New York State barge canal. Alabama producers, however, are reported to be holding firmly at $11, Birmingham, and full 50c. differentials for silicon content. Pig iron sales in this district, at 5000 tons, compare with 8000 tons in the previous week and 5500 tons two weeks ago.

Melt, as reflected in shipments, shows virtually no improvement, and sizable open inquiries are few and far between.

The Worthington Pump & Machinery Corpn. has closed against its inquiry for 1000 tons for second quarter delivery at Buffalo. The New York Central Railroad is in the market for 150 tons for shipment to Frankfort, N. Y., or Elkhart, Ind.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$19.91 to $20.41
*Buff. No. 2, del'd east N. J.	18.28 to 18.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	17.39 to 17.89
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	17.89 to 18.39

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

FINISHED STEEL

Price advances on bars, shapes and plates, on the one hand, and weakness in sheet and strip steel prices, on the other, seem to have placed buyers in somewhat of a dilemma. Whether a lull in steel buying in the past week can be attributed solely to the price situation is not clear, but at any rate nearly all sellers in this market have noted a decided falling off in new business. The fact that the minimum price on bars, shapes and plates for second quarter has been announced as 1.65c., Pittsburgh, or 1.75c., Eastern basing points, did not drive in very much business against first quarter contracts taken at prices $1 a ton lower, but some consumers specified what they might need for the next two or three weeks. It is apparent that buyers are not to be rushed into buying more than they have immediate use for, even though they might save money by putting material in stock.

Black sheets are now generally quoted at 2.25c., Pittsburgh, to the larger buyers, and one sale of 1000 tons was made at 2.20c. Shading of galvanized sheets $1 or $2 a ton to large users and distributers continues. Announced advances on strip steel have gone by the board, and both hot and cold-rolled products are available at the quotations formerly in effect. Low prices quoted by concrete bar distributers have resulted in pressure upon the mills for concessions, which are being strongly resisted. The bar distributers are meeting with low-priced competition from foreign steel and domestic rail steel bars.

STEEL BARS

There is increasing activity in structural steel, a good many small jobs coming out for bids, but aside from this development the market has been devoid of encouraging features. Steel sellers are hopeful, however, that when price uncertainty has been removed from buyers' minds, there will be a resumption of a volume of orders equal to that of the first half of March.

CAST IRON PIPE

Prices quoted on recent public inquiries for pressure pipe have been $1 to $2 a ton lower than the previous level of $34 a ton, f.o.b. Northern foundry. The low bidders on about 4600 tons of 6, 8 and 12-in. cement-lined pipe for the City of New York are R. D. Wood & Co. on 2600 tons, United States Pipe & Foundry Co. on 1000 tons and Central Foundry Co. on 1000 tons. The lowest bid submitted was $38 a net ton, delivered and piled in the city yard. On a separate inquiry by New York for 350 tons of pipe for delivery in the Borough of Manhattan, the Warren Foundry & Pipe Co. was low bidder. An inquiry is being prepared by the city for 300 tons to be delivered to the Borough of Richmond.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $35.90 to $36.90; 4-in. and 5-in., $38.90 to $39.90; 3-in., $45.90 to $46.90. Class A and gas pipe, $3 extra.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10)	3.00c. to 3.25c.
Black sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ⅜ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65 to 65 and 10
¾ x 20 in. and smaller	65 to 65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in	$19.00
Seamless steel, 2-in	20.25
Charcoal iron, 2-in	26.25
Charcoal iron, 4-in	67.00

WAREHOUSE BUSINESS

March has been a better month than either January or February for most jobbers in this district, but the total business is still under the usual tonnage at this season. Except for occasional slight concessions as a result of competition from foreign shapes, warehouses report prices fairly well maintained, even black and galvanized sheet prices showing a tendency to firmness.

REINFORCING BARS

Competition for bar tonnages which have recently been placed has brought a wide range of quotations by distributers, who have found it necessary to grant concessions of $1 to $2 a ton on the more desirable contracts. In cases where rail steel bars were under serious consideration by the buyer even larger concessions have been necessary.

OLD MATERIAL

Except for purchases of No. 1 and No. 2 steel for barge shipment to Buffalo, on contracts with two consumers in that district totaling 7000 to 8000 tons, the scrap market is extremely quiet. The two leading users of No. 1 heavy melting steel in eastern Pennsylvania are not accepting deliveries on contracts. Prices are generally unchanged in the absence of new transactions.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$6.50 to	$7.50
Heavy melting steel (yard)	5.00 to	5.25
No. 1 hvy. breakable cast	6.75 to	7.50
Stove plate (steel works)	4.75 to	5.00
Locomotive grate bars	4.75 to	5.00
Machine shop turnings		3.50
Short shoveling turnings		3.50
Cast borings (blast fur. or steel works)		3.50
Mixed borings and turnings		3.00
Steel car axles	13.00 to	14.00
Iron car axles	17.00 to	17.50
Iron and steel pipe (1 in. dia., not under 2 ft. long)		7.25
Forge fire	6.50 to	6.75
No. 1 railroad wrought		8.75
No. 1 yard wrought, long		7.75
Rails for rolling	9.25 to	9.75
Stove plate (foundry)	5.50 to	6.00
Malleable cast (railroad)	9.00 to	9.50
Cast borings (chemical)	8.50 to	9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$12.50
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	10.50
No. 2 cast (radiators, cast boilers, etc.)	10.00

PHILADELPHIA

Pennsylvania Railroad Places 124,900 Tons of Steel

PHILADELPHIA, March 31.—The feature of the week's business here was award today by the Pennsylvania Railroad of 124,900 tons of fabricated structural steel for electrification work between Washington and New York and terminal construction at West Philadelphia and Newark. About half of the steel is for electrification materials and about 18,000 tons for the new station, concourse and plaza at West Philadelphia. The American Bridge Co. received 26,000 tons, McClintic-Marshall Corpn., 34,000 tons and the remainder went to smaller fabricators, as reported elsewhere in this issue.

Except for this one unusually large contract, and opening of bids on eight steel barges requiring about 3000 tons of plates, the steel market was quieter in the past week than earlier in the month. Buyers generally show little disposition to enter into commitments for the second quarter. Plate and shape users are inclined to seek renewal of current contracts at no advance in price. For second quarter contracts, mills are quoting 1.65c., Pittsburgh, for bars; 1.75c., Coatesville, Pa., for plates, and 1.75c., f.o.b. mill, for shapes. Operating rates in eastern Pennsylvania are unchanged at about 40 per cent of capacity, except for the leading independent, whose operations are at 53 per cent.

PIG IRON

Local foundries are engaged in a moderate tonnage of small work, but, with business on their books limited to contracts that are scheduled for early completion, they are not inclined to buy iron for forward delivery. Eastern Pennsylvania furnaces quote foundry grade iron at $17 a ton, furnace, and occasionally grant a concession of 50c. a ton on the more desirable business. Southern makers appear to be firm in maintaining $11 a ton, furnace, on all ordinary business. There have been some small purchases of malleable iron recently, at about $20 a ton, delivered, and small lots of Buffalo malleable have been sold at $20.40 a ton, delivered.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$17.76 to	$18.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.26 to	18.76
East. Pa. No. 1X	18.76 to	19.26
Basic (del'd east. Pa.)	17.25 to	17.50
Malleable	19.00 to	20.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to	23.00
Va. No. 2 plain, 1.75 to 2.25 sil.		22.29
Va. No. 2X, 2.25 to 2.75 sil.		22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

STEEL BARS

Sellers are quoting 1.65c., Pittsburgh, or 1.94c., Philadelphia, on contracts for second quarter delivery, but only a small number of commitments have been made by buyers in this district. Reinforcing bars are quoted by distributers at 1.65c., Pittsburgh, for medium-sized tonnages and at 1.70c. to 1.75c., Pittsburgh, or 2.19c. to 2.24c., Philadelphia, for less than carload lots. Rail steel bars are quoted at 1.35c., Pittsburgh, or 1.64c., Philadelphia.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
†Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ⅝-in. inclu.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
‡Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'l'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

SHAPES

Mills are quoting 1.70c. to 1.75c., f.o.b. nearest mill to consumer, or 1.76c. to 1.81c., Philadelphia. With fabricating shops quoting on only a small tonnage of new business, there is little interest in contracting for second quarter, but certain buyers have asked for protection at 1.70c., mill, or 1.76c., Philadelphia, for future requirements.

PLATES

Quotations are generally 1.75c., Coatesville, Pa., or 1.85½c., Philadelphia, for second quarter delivery. Some small contracting is reported, with buyers in certain cases seeking to cover their requirements for the next three months at the former price of 1.70c., Coatesville, Pa., or 1.80½c., Philadelphia.

SHEETS

Inquiry for sheets continues fairly active, but individual orders are small and prices lack firmness. Black sheet prices, based on recent transactions, range from 2.25c. to 2.35c., Pittsburgh, or 2.54c. to 2.64c., Philadelphia, and galvanized from 2.80c. to 2.90c., Pittsburgh, or 3.09c. to 3.19c., delivered Philadelphia. In the case of both black and galvanized sheets, the lower range of the price is quoted to the large preferred buyers and to distributers, while the upper range is applied on lots of less than a carload. Blue annealed sheets, No. 13 gage, are quoted at 2.05c., Pittsburgh, or 2.34c., Philadelphia, and blue annealed plates, No. 10 gage, at 1.90c., Pittsburgh, or 2.19c., Philadelphia. These prices are fairly well maintained on the wider, jobbing mill specifications, but in the narrow sizes, especially under 40-in. wide, competition from the product of the continuous mill often brings concessions of $2 a ton or more.

IMPORTS

In the week ended March 28 a total of 399 tons of chrome ore arrived at this port from Russia. Steel imports consisted of 92 tons of structural shapes, 54 tons of steel bars and 11 tons of steel bands from Belgium.

OLD MATERIAL

The market is quiet. With no transactions of consequence, prices of all grades are unchanged.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$10.00 to	$11.00
No. 2 heavy melting steel		9.00
Heavy melting steel (yard)		8.50
No. 1 railroad wrought	11.50 to	12.00
Bundled sheets (for steel works)		9.00
Hydraulic compressed, new	9.00 to	10.00
Hydraulic compressed, old	8.00 to	8.50
Machine shop turnings (for steel works)		7.50
Heavy axle turnings (or equiv.)	9.50 to	10.00
Cast borings (for steel works and roll. mill)		7.50
Heavy breakable cast (for steel works)		11.00
Railroad grate bars		9.00
Stove plate (for steel works)		9.00
No. 1 low phos., hvy., 0.04% and under	16.50 to	17.50
Couplers and knuckles	15.00 to	15.50
Rolled steel wheels	15.00 to	15.50
No. 1 blast f'nace scrap	6.00 to	6.50
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to	12.00
Shafting		18.00
Steel axles	17.50 to	18.00
No. 1 forge fire		10.50
Cast iron carwheels	13.00 to	13.50
No. 1 cast	12.00 to	12.50
Cast borings (for chem. plant)	14.00 to	14.50
Steel rails for rolling	12.50 to	13.00

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Detroit Scrap Market Still Shows Weakness

DETROIT, March 31.—The scrap market continues listless, with prices showing a tendency to sag. The only exception is hydraulic compressed sheets, for which a local dealer paid relatively high prices the past week. Borings and turnings are down 25c. a ton.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$9.00 to	$9.50
Borings and short turnings	4.50 to	5.00
Long turnings	4.00 to	4.50
No. 1 machinery cast	9.50 to	10.00
Automotive cast	11.25 to	11.75
Hydraul. comp. sheets	8.75 to	9.25
Stove plate	6.50 to	6.75
New No. 1 busheling	7.50 to	8.00
Old No. 2 busheling	3.25 to	3.75
Sheet clippings	6.25 to	6.50
Flashings	7.75 to	8.25

ST. LOUIS

Basic Pig Iron and Scrap Purchased—Steel Orders Gain Slightly.

ST. LOUIS, March 31.—A leading melter of basic pig iron in the St. Louis industrial district has contracted for its second quarter requirements with the St. Louis Gas & Coke Corpn., and other basic users are expected to come into the market within the next few days. Sales of foundry iron by this maker during the week amounted to 1100 tons in lots up to 200 tons. Shipments show improvement. The market is said to be stronger. The quotation of $11, f.o.b. Birmingham, on Southern iron is reported to be more general. The Federal Reserve Bank of St. Louis reports that the daily average rate of melt during the first half of March was measurably larger than for February.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	$14.92 to 15.42
Northern malleable, deliv'd	19.66
Northern basic, deliv'd	19.66

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

FINISHED MATERIAL

The price of 1.80c. a lb., f.o.b. Chicago, which is to be established on April 1 on plates, shapes and bars has been made known to all consumers in the district, with the assurance of mills that it is to be made effective. The result has been some increase in buying and generally more interest in placing of requirements. Structural projects awarded during the week include 1000 tons to the Mississippi Valley Structural Steel Co. for the St. Louis *Star* building and 250 tons to the St. Louis Structural Steel Co for 14 pontoons for the Federal Government. The Laclede Steel Co. received orders for 235 tons of reinforcing bars for an academy at San Antonio, Tex., and 190 tons for a New Mexico highway project. Buying by railroads and oil fields continues light.

OLD MATERIAL

The scrap market took on new life this week with the placing of orders by an East Side mill for 4000 tons of heavy melting steel. The business was well distributed among local dealers. Deliveries are to be made during April and May. Steel car axles, wrought iron bars and transoms, No. 1 railroad wrought, and steel rails less than 3 ft. are 50c. a ton lower than last week, while No. 1 machinery cast and iron car axles are 25c. and $1 lower respectively.

Railroad lists: Pennsylvania, 52,372 tons; Atchison, Topeka & Santa Fe, 5686 tons; Union Pacific, 1334 tons; Missouri-Kansas-Texas, 500 tons; Missouri Pacific, 132 carloads; Milwaukee Road, 108 carloads; New York, Chicago & St. Louis, St. Louis-San Francisco, and Chicago & Eastern Illinois, 39 carloads each; Mobile & Ohio, 16 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$10.00 to $10.50
No. 1 heavy melting or shoveling steel	8.75 to 9.25
No. 2 heavy melting or shoveling steel	8.25 to 8.75
No. 1 locomotive tires	10.75 to 11.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	9.50 to 10.00
Railroad springs	12.00 to 12.50
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought	8.75 to 9.25
No. 1 busheling	6.00 to 6.50
Cast iron borings and shoveling turnings	5.75 to 6.25
Iron rails	8.00 to 8.50
Rails for rolling	10.75 to 11.25
Machine shop turnings	3.00 to 3.50
Heavy turnings	7.00 to 7.50
Steel car axles	13.50 to 14.00
Iron car axles	19.00 to 19.50
Wrot. iron bars and trans.	9.00 to 9.50
No. 1 railroad wrought	8.00 to 9.00
Steel rails, less than 3 ft.	12.00 to 12.50
Steel angle bars	9.00 to 9.50
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	9.00 to 9.50
Railroad malleable	10.00 to 10.50
No. 1 railroad cast	9.00 to 9.50
Stove plate	7.00 to 7.50
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	9.50 to 10.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shaftings, screw stock	3.60c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.10c.
Galv. corrug. sheets	4.65c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60 and 10
Carriage bolts	60 and 10
Lag screws	60 and 10
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60 and 10
Less than 200 lb.	50 and 10
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60 and 10
Less than 200 lb.	50 and 10

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CINCINNATI

Pig Iron Inquiry More Active—Scrap Market Very Dull

CINCINNATI, March 31.—Pig iron sales have been fairly steady at about 1800 to 2000 tons a week for the last five weeks. New business in the past week consisted of small orders for immediate needs. Inquiry, however, has been more active. Furnace representatives now have two inquiries from Ohio melters for 500 and 100 tons of Northern iron respectively, one from an Indiana consumer for 500 tons and a fourth from a Michigan user for 1000 tons of malleable. District foundries making castings for automotive manufacturers have been operating at a better rate. Foundries handling machine tool business are still operating at a low rate.

Prices per gross ton, deliv'd Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$14.19 to $14.69
Ala. fdy., sil. 2.25 to 2.75	14.69 to 15.19
Tenn. fdy., sil. 1.75 to 2.25	14.19 to 14.69
S'th'n Ohio silvery, 8 per cent	24.39

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

COKE

While shipments of foundry grades of coke are better than in February, the movement is still slow. Quotations on by-product coke will continue at about $9, delivered Cincinnati.

FINISHED STEEL

Orders for sheets in the past week were about at the level of the week before, but this rate of buying is slightly below the demand of preceding weeks. Production, in keeping with the demand, has been reduced slightly, but is still above 50 per cent.

OLD MATERIAL

Users of scrap iron and steel are conservative in purchases and in specifications against contracts. Dealers' bids are unchanged, since no test of prices has occurred.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$9.00 to $9.50
Scrap rails for melting	10.50 to 11.00
Loose sheet clippings	5.00 to 5.50
Bundled sheets	8.50 to 9.00
Cast iron borings	4.50 to 5.00
Machine shop turnings	4.50 to 5.00
No. 1 busheling	7.50 to 8.00
No. 2 busheling	4.50 to 5.00
Rails for rolling	11.50 to 12.00
No. 1 locomotive tires	10.00 to 10.50
No. 2 railroad wrought	9.00 to 9.50
Short rails	14.25 to 14.75
Cast iron carwheels	10.50 to 11.00
No. 1 machinery cast	14.00 to 14.50
No. 1 railroad cast	12.00 to 12.50
Burnt cast	6.50 to 7.00
Stove plate	6.50 to 7.00
Brake shoes	6.50 to 7.00
Agricultural malleable	11.00 to 11.50
Railroad malleable	12.00 to 12.50

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex.	3.80c.
Squares	4.30c.
Black sheets (No. 24)	3.90c.
Galvanized sheets (No. 24)	4.40c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

BUFFALO

Pig Iron Shipments Increasing—Steel Plant Operations Off

BUFFALO, March 31.—Pig iron shipping directions continue to improve, although new sales are not heavy. Sales for the district during the past week are estimated at 4000 to 4500 tons. An inquiry for 1000 tons of foundry iron comes from Worcester, Mass. Some of the furnaces are maintaining a $16 minimum on Eastern business, but others probably would shade this figure in the face of competition on large tonnage.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$17.50
No. 2X fdy., sil. 2.25 to 2.75	18.00
No. 1 fdy., sil. 2.75 to 3.25	19.00
Malleable, sil. up to 2.25	18.00
Basic	17.50
Lake Superior charcoal	27.28

FINISHED STEEL

Operations in the Buffalo district are lower, with the Lackawanna plant of the Bethlehem Steel Co. operating 12 of 24 open-hearths, a loss of two, and around 50 per cent finishing operations. The Donner plant of the Republic Steel Corpn. is operating three open-hearths; Wickwire-Spencer, two, and Gould Coupler, one. The Seneca Iron & Steel Co. is operating from 50 to 60 per cent. Sheet demand is spotty. Among the reinforcing bar awards of the week is one of 100 tons for the Batavia Institute for the Blind. Steel for several small State bridges has also been let, some of the business coming to Buffalo makers. A bridge requiring 100 tons of structural steel to be built near Rochester has been awarded to a Buffalo fabricator.

OLD MATERIAL

The market continues quiet, with only two sales of importance. A Niagara Falls consumer bought 2500 tons of machine shop turnings from a Detroit company at $8.75, delivered Niagara Falls. Another concern located on the frontier bought 2500 tons at the same price, namely $5.15, Detroit, plus $3.60 freight rate. Niagara Falls had previously been paying no more than $7, delivered, from Buffalo dealers, and considerable machine shop turnings can still be had in Buffalo at the regularly quoted prices. The largest consumer in the district continues to pay $11 for No. 1 heavy melting steel and $9.50 for No. 2 heavy melting steel, and is expanding its program of direct buying from producers and smaller dealers. This concern will not accept from the larger dealers any prepared scrap that these dealers have not themselves prepared.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel		$11.00
No. 2 heavy melting scrap		9.50
Scrap rails		11.00
Hydraul. comp. sheet		9.50
Hand bundled sheets	$8.00 to	8.50
Drop forge flashings		9.50
No. 1 busheling		9.50
Hvy. steel axle turnings	10.50 to	11.00
Machine shop turnings	5.50 to	6.00
No. 1 railroad wrought	9.00 to	9.50
Acid Open-Hearth Grades:		
Knuckles and couplers	13.50 to	14.00
Coil and leaf springs	13.50 to	14.00
Rolled steel wheels	13.50 to	14.00
Low phos. billet and bloom ends	15.00 to	15.50
Electric Furnace Grades:		
Short shov. steel turnings	8.50 to	9.00
Blast Furnace Grades:		
Short mixed borings and turnings	7.00 to	7.25
Cast iron borings	7.00 to	7.25
No. 2 busheling		6.00
Rolling Mill Grades:		
Steel car axles	15.00 to	15.50
Iron axles	16.00 to	16.50
Cupola Grades:		
No. 1 machinery cast	10.00 to	10.50
Stove plate	10.00 to	10.50
Locomotive grate bars	8.25 to	9.25
Steel rails, 3 ft. and under	14.00 to	14.50
Cast iron carwheels	12.50 to	13.00
Malleable Grades:		
Industrial	11.00 to	12.00
Railroad	11.00 to	12.00
Agricultural	11.00 to	12.00
Special Grades:		
Chemical borings	9.50 to	10.00

Warehouse Prices, f.o.b. Buffalo

	Base per Lb
Plates and struc. shapes	3.25c.
Soft steel bars	3.15c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.60c.
Bands	3.50c.
Hoops	3.90c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.60
Black wire, base per 100 lb	3.20

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BIRMINGHAM

Another Blast Furnace Blown In, a Gain of Two for March

BIRMINGHAM, March 31.—The arrival of the second quarter has brought very little change in the pig iron situation. Some melters who bought moderately for the first quarter have ordered their second quarter requirements, while others continue to buy as needed. The carryover of undelivered iron booked for first quarter is said to be heavy and in many cases will cover second quarter needs. Prices for the Birmingham district continue to range from $12 to $13. Merchant producers report that shipments during March exceeded production. The Woodward Iron Co. blew in its No. 3 furnace on foundry iron on Saturday, March 28, and is now operating three stacks, all on foundry. This increases the number of active stacks in Alabama to 13, and is a gain of two for March, Republic Steel Corpn. having blown in a second furnace the middle of the month. Of the 13 active stacks, three are on basic, eight on foundry, one on recarburizing iron and one on ferromanganese.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$12.00 to $13.00
No. 1 fdy., 2.25 to 2.75 sil.	12.50 to 13.50
Basic	12.00 to 13.00

CAST IRON PIPE

The past week brought no change in operations and market conditions. New tonnage is being booked from day to day, but not in sufficient amount to take care of production. Plants are operating at about 65 per cent. Quotations continue at $35 to $36.

FINISHED STEEL

New tonnage from week to week is running along at a fair level. Demand is fairly well distributed. The volume for March was on a par with that of the two preceding months. Structural steel and reinforcing bar fabricators have had only an ordinary run of small orders, most of the bar orders being for highway work. The Tennessee company is operating 13 open-hearths and the Gulf States Steel three, the same as last week.

COKE

About the only activity of the coke market is the renewal of contracts for the second quarter. Instead of carrying over undelivered tonnage, new contracts are being made as a rule to replace the old ones. Woodward Iron Co. will fire additional ovens this week as a result of blowing in another furnace. Quotations are being maintained at $5.

OLD MATERIAL

Occasional buying of steel grades in limited amounts constitutes about the only activity in old material. Some foundries and pipe plants are increasing their consumption, but not enough to add much tone to the market. Prices are stationary.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$10.50 to	$11.00
Scrap steel rails		10.50
Short shoveling turnings		9.00
Cast iron borings		8.50
Stove plate		8.50
Steel axles		19.00
Iron axles		18.00
No. 1 railroad wrought		10.00
Rails for rolling	11.50 to	12.00
No. 1 cast		11.00
Tramcar wheels	11.00 to	11.25
Cast iron borings, chem.		13.50
Cast iron carwheels		11.00

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Estimated total value of mineral products in the United States in 1930 was approximately $4,795,000,000, as announced by Scott Turner, director of the United States Bureau of Mines, Department of Commerce. This is a drop of about 18 per cent from the total value of mineral products in 1929.

BOSTON

Low Prices Made on Pig Iron—Cast Iron Pipe Lower

BOSTON, March 31.—Though pig iron buying is at a minimum, not more than 1500 tons having been closed in the past week, competition has been accentuated by the prospective blowing in of a New York State furnace. A Rhode Island melter has bought 500 tons of No. 1X at a concession, and the week before a Massachusetts foundry purchased 500 tons of No. 1X at $19.40, delivered. Buffalo iron is generally to be had at $15, furnace, for No. 2 and No. 2X grades, while Alabama iron is offered at $11, Birmingham, with 50c. differentials on No. 2X and No. 1X.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.91 to $20.91
*Buffalo, sil. 2.25 to 2.75	19.91 to 20.91
*Ala., sil. 1.75 to 2.25	20.11 to 20.61
*Ala., sil. 2.25 to 2.75	20.61 to 21.11
†Ala., sil. 1.75 to 2.25	16.75
†Ala., sil. 2.25 to 2.75	17.25

Freight rates: $4.81 all rail from Buffalo; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.
*All rail rate.
†Rail and water rate.

CAST IRON PIPE

The average going price for 6-in. and larger pipe has dropped from $36 a ton, foundry, to $34, but even lower prices were made the past week. R. D. Wood & Co. bid $35.80 a ton, delivered, on 5000 ft. of 10-in. and 500 ft. of 6-in. for a Massachusetts private water company, but the business was placed with the Donaldson Iron Co. at a higher price. Yarmouth, Mass., has placed 350 tons of pipe with the United States Pipe & Foundry Co.; Saugus, Mass., 150 tons of 6 to 12-in. with the McWane Cast Iron Pipe Co.; West Springfield, 300 lengths of 6-in. and 50 lengths of 4-in. with the Warren Foundry & Pipe Co., and Leominster, Mass., 116 tons of 8 in. and 188 tons of 16 in. with R. D. Wood & Co. Watertown, Mass., is taking bids on 520 tons of pipe, and Revere, Mass., on 10,000 ft. of 6 to 12-in. Natick, Mass., has closed bids on 246 tons of 12-in. and 33 tons of 6-in., a total of 279 tons, but has made no award.

FINISHED STEEL

The Commercial Shearing & Stamping Co., Youngstown, has been awarded 12,000 tons of steel required for the first section of the East Boston tunnel, Boston. This award is the largest made for New England consumption in several years. Included in the tonnage are 4000 tons of plates, 2500 tons of T rails, 2500 tons of structural steel, 2000 tons of reinforcing bars, 500 tons of channels and 500 tons of angles. The introduction of T rails in tunnel construction is unique. The outer shell of that part of the tunnel to which the rails will be applied will be circular in construction and of fabricated plates. The T rails will be welded to the inner surface of the plates, just sufficiently far apart to give greater pressure resistance, according to the claims of the Boston Transit Commission, than ever before obtained in tunnel work. There will be an inner shell of plates, and between it and the outer a concrete filler.

REINFORCING BARS

For the East Boston tunnel, the Boston Transit Commission has placed 2000 tons of billet bars with the Commercial Shearing & Stamping Co., Youngstown. Bids were taken March 26 on 700 tons of billet bars for a Kenmore Station subway extension. The bid of the Bancroft & Martin Rolling Mill Co., Portland, Me., of $40.10 a ton, delivered, was the lowest, all other bids having been $41. On April 6, Massachusetts will close bids on several road jobs calling for 500 to 600 tons of bars. The past week's small lot sales aggregated not more than 350 tons.

OLD MATERIAL

Business continues quite flat. Occasionally a distress car of No. 1 heavy melting steel, steel turnings, bundled skeleton and breakable cast is moved to Pennsylvania and Worcester, Mass., but the movement of other grades of scrap is practically nil.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$6.75 to $7.30
Scrap T rails	6.50 to 7.00
Scrap girder rails	5.50 to 6.00
No. 1 railroad wrought	7.00 to 7.50
Machine shop turnings	2.00 to 2.60
Cast iron borings (steel works and rolling mill)	2.00 to 2.60
Bundled skeleton, long	6.00 to 6.10
Forge flashings	5.60 to 6.10
Blast furnace borings and turnings	2.00 to 2.60
Forge scrap	5.10 to 5.60
Shafting	13.00 to 13.50
Steel car axles	14.00 to 15.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.50 to 7.00
Rails for rolling	8.50 to 9.00
Cast iron borings, chemical	9.00 to 9.60
No. 2 cast	5.10 to 5.60
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$9.00 to $9.50
No. 1 machinery cast	10.50 to 11.00
Stove plate	7.00 to 7.25
Railroad malleable	13.00 to 13.50

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Reinforcing Steel

Awards of 12,600 Tons—Inquiries Light

LETTINGS of reinforcing steel the past week totaled 12,600 tons, the largest in any week for more than a year. Of this amount 5000 tons will be used in a sewage treating plant at Chicago. Contracts in March called for 30,400 tons, compared with 20,300 tons in February and 21,230 tons in January. New projects are in small volume, totaling only 2400 tons, 1300 tons of which is for station work at Cincinnati for the Cincinnati Union Terminals Co. Awards follow:

BOSTON, 2000 tons, East Boston tunnel, to Commercial Shearing & Stamping Co.

HOLYOKE, MASS., 150 tons, filtration plant, to Joseph Ryerson & Son, Inc.

NEW YORK, 1000 tons, Interborough bridge in Queens, placed by Welsh Construction Co. with Concrete Steel Co.

NEW YORK, 100 tons, Clifton grade elimination on Staten Island, placed by W. H. Gahagan, Inc., with McClintic-Marshall Corpn.

NEW YORK, 225 tons, Walker-Lispenard building, to Carroll-McCreary Co.

NEW YORK, 100 tons, bridge over Sunrise Highway at Cross Island Boulevard, to Tidewater Structural Material Corpn.

JAMAICA, N. Y., 1000 tons, subway section, to Concrete Steel Co.

BATAVIA, N. Y., 100 tons, addition for Batavia Institute for Blind, to a Buffalo bidder.

PITTSBURGH, 820 tons, Post Office building foundation, to Truscon Steel Co.

FORT WAYNE, IND., 1100 tons, filtered water reservoir, to Joslyn Mfg. Co.

SAN ANTONIO, TEX., 235 tons, St. Mary's Academy, to Laclede Steel Co.

ALBUQUERQUE, N. M., 190 tons, highway projects, to Laclede Steel Co.

STATE OF ILLINOIS, 250 tons, highway paving, to Concrete Engineering Co.

CHICAGO, 160 tons, mesh for Sanitary District, to an unnamed bidder.

CHICAGO, 5000 tons, sewage treating plant for Sanitary District, to an unnamed bidder.

CHICAGO, 200 tons, store and office building, to Calumet Steel Co.

SACRAMENTO, CAL., 200 tons, paving in Imperial County, to an unnamed bidder.

LOS ANGELES, 200 tons, library for University of Southern California, to an unnamed bidder.

LOS ANGELES, 100 tons, church on University Avenue, to an unnamed company.

TACOMA, WASH., 100 tons, telephone building, to Pioneer Sand & Gravel Co.

SEATTLE, 200 tons, Federal Building, to Soule Steel Co.

SEATTLE, 500 tons, bridge decking for Lake Union bridge, to Pioneer Sand & Gravel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

STATE OF MASSACHUSETTS, 500 tons, road work.

GREENWICH, MASS., 100 tons, gate house, State water project.

NEW YORK, 270 tons, warehouse between Fifteenth and Sixteenth Streets, Ninth and Tenth Avenues, for Port of New York Authority; Godwin Construction Co., low bidder on general contract.

NEW YORK, 1000 tons, Tri-Borough bridge; Longacre Engineering Co., low bidder on general contract.

STATE OF NEW JERSEY, 2000 tons, three bridges at Somers Point; Eastern Engineering Co., Atlantic City, low on general contract.

WASHINGTON, 121 tons, Klingle Valley bridge; W. P. Thurston Co., Inc., Richmond, Va., low bidder on general contract.

CINCINNATI, 1300 tons, station work for Cincinnati Union Terminals Co.

CHICAGO, 100 tons, Randolph Street Station for Illinois Central.

LOS ANGELES, 4000 tons, Sixth Street viaduct; bids April 29.

SACRAMENTO, 254 tons, paving in San Mateo County; bids April 8.

SACRAMENTO, 138 tons, paving in Los Angeles County; bids April 15.

PACIFIC COAST

SAN FRANCISCO, March 28 (By Air Mail).—While few new inquiries of importance developed during the week, awards of reinforcing steel bars and structural shapes were fairly numerous. Featuring the lettings were 4500 tons of plates for a pipe line in Los Angeles and 950 tons of shapes for bridges for the Western Pacific Co., San Francisco.

BARS

Awards of reinforcing steel bars were the second largest for any week so far this year. Among the larger lots were 500 tons for bridge decking for the Lake Union bridge, Seattle, booked by the Pioneer Sand & Gravel Co.; 200 tons for the Federal Building, Seattle, placed with the Soule Steel Co., and 200 tons for a library in Los Angeles, taken by an unnamed interest. New inquiries include 4000 tons for the Sixth Street viaduct, Los Angeles, bids on which will be opened April 29, and 400 tons for two paving projects in California. No change in out-of-stock prices is noted, 2.60c., base, on carload lots being firm in the San Francisco district and 2.50c., base, in the Los Angeles district.

PLATES

The Steel Tank & Pipe Co. booked 880 tons for a 30-in. welded steel pipe for Oakland. Los Angeles awarded 1500 tons and 3000 tons respectively to the Consolidated Steel Corpn. and the Western Pipe & Steel Co. for 24 to 36-in. welded steel pipe. Current inquiries are confined to lots of less than 100 tons. Quotations remain unchanged at 2c. to 2.05c., c.i.f.

SHAPES

Demand for structural shapes is well sustained. Bookings included 800 tons for a library for the University of Southern California, Los Angeles, placed with the Consolidated Steel Corpn.; 250 tons for a store addition in Portland, secured by Poole & McGonigle, and 300 tons for a church addition in San Francisco, booked by the Judson - Pacific Co. Bids will be opened April 29 on 1200 tons for the Sixth Street viaduct, Los Angeles, and bids have been opened on 320 tons for pier No. 15, San Francisco. Prices range from 2.05c. to 2.15c., c.i.f., on plain material.

CAST IRON PIPE

The only award of size involved 787 tons of 4 to 24-in. Class B and C pipe for Bellingham, Wash., placed with the United States Pipe & Foundry Co. Bids were opened on 136 tons of 4 to 10-in. Class 150 pipe for the National Guard training camp, near San Luis Obispo, Cal. No award has been made on 328 tons of 10 and 14-in. Class B pipe for Redwood City, Cal. Bids will be opened March 31 on 135 tons of 6 to 12-in. Class B pipe for Glendora, Cal.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	2.50c.
Soft steel bars	2.50c.
Black sheets (No. 24)	4.15c.
Blue ann'l'd sheets (No. 10)	3.05c.
Galv. sheets (No. 24)	4.65c.
Struc. rivets, ½-in. and larger	5.00c.
Com. wire nails, base per keg	$3.35
Cement c't'd nails, 100 lb. keg	3.35

Structural Steel and Reinforcing Bar Awards Gaining

Pig iron prices per gross ton at San Francisco:

*Utah basic	$22.00 to $24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

SHEETS

The bulk of both sales and inquiries involve lots of less than 100 tons. The Beall Tank & Pipe Co., Portland, secured 300 tons of corrugated galvanized sheets for culverts for the Great Northern Railroad. Prices are now on a firmer basis, No. 10 gage blue annealed and No. 24 gage black and galvanized sheets being quoted at 2.50c., 3c. and 3.50c., c.i.f., respectively.

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Canada

Pig Iron Sales Improving—Structural Steel Active

TORONTO, March 31.—Some improvement in sales and shipping orders featured business in the Canadian pig iron markets during the week. While there has been no rush on the part of melters to cover, a number have come forward with contracts for iron for delivery to the end of June, the majority of the contracts running to better tonnage than those booked for first quarter delivery. Most of the buying is the direct result of rolling stock equipment contracts, and is from builders of cars and locomotives and plants making castings, wheels, etc. Spot buying is holding up well. Total sales for the week for current delivery were about 1200 tons. March output will run considerably above that of February. Most of the gain is in foundry iron. Pig iron prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	20.50

STRUCTURAL STEEL

While there is some improvement in demand for steel for building construction, most of the business closed by fabricators during the week was for bridge work. Contracts for bridge steel pending in Quebec alone involve upward of 20,000 tons, while Ontario will require close to 8000 tons for such work during the next month or two. The Dominion Bridge Co. was a successful bidder for new business during the past few days, having closed contracts for upward of 15,000 tons for its various plants. Structural steel is the most active branch of the Canadian iron and steel industry from the standpoint of production and new business.

OLD MATERIAL

The demand for iron and steel scrap is showing slow improvement. Hamilton mills have announced that they will accept delivery of heavy melting steel and turnings, but are strict as to specifications. No large booking for future delivery is reported from this source, due largely to the fact that the Steel Co. of Canada is still holding big tonnages of scrap acquired from the railroads last year. The betterment in the market is almost entirely the result of increased buying by foundries. Machinery cast is in steady demand, both for spot and future delivery: malleable scrap was more active during the week, and stove plate was spotty. Dealers are still out of the market for most grades, but are picking up machinery cast at every opportunity and some are drawing supplies from across the boundary to meet growing demands.

Dealers' buying prices for old material:

Per Gross Ton	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	....	10.00
Stove plate	....	8.00
Standard carwheels	....	8.50
Malleable	....	8.00
Per Net Ton		
No. 1 mach'ry cast	11.00	....
Stove plate	9.00	....
Standard carwheels	10.00	....
Malleable scrap	9.00	....

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Railroad Equipment

Order Placed for 1000 Refrigerator Cars

Merchants Despatch, Inc., has awarded contract to Merchants Despatch Transportation Co. for 1000 steel frame refrigerator cars.

Chicago, South Shore & South Bend has given an order to Ryan Car Co. for the repair of five composite gondola cars.

Hauser Construction Co. has ordered eight dump cars from Magor Car Corpn.

East Jersey Railroad & Terminal Co. has placed 17 tank cars with American Car & Foundry Co.

Standard Oil Co. of New Jersey is inquiring for three tank cars of 3000-gal. capacity.

Albany, N. Y., Port District Commission is inquiring for one oil-electric locomotive.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

MILL PRICES OF SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$30.00
Rerolling, 4-in. and under 10-in., Youngstown	30.00
Rerolling, 4-in. and under 10-in., Cleveland	30.00
Rerolling, 4-in. and under 10-in., Chicago	$31.00 to 32.00
Forging quality, Pittsburgh	36.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$30.00
Youngstown	30.00
Cleveland	30.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$30.00
Youngstown	30.00
Cleveland	30.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.65c.
Universal	1.65c.
Sheared	1.65c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$35.00 to $37.00
Cleveland	35.00 to 37.00
Chicago	35.00 to 37.00

PRICES OF RAW MATERIAL

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic or foundry, Swedish, average 65% iron	9.00c.
Manganese ore, washed 52% manganese, from the Caucasus	25c. to 27c.
Manganese ore, African or Indian, 50 to 52%	24c. to 26c.
Manganese ore, Brazilian, 46 to 48%	22c. to 24c.
Tungsten ore, high grade, per unit, in 60% concentrates	$12.00 to $12.25

	Per Gross Ton
Chrome ore, 45% Cr_2O_3 crude, c.i.f. Atlantic seaboard	$20.00
Chrome ore, 48% Cr_2O_3 crude, c.i.f. Atlantic seaboard	22.50

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.50
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b. ovens	8.00
Foundry, by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.35 to $1.50
Mine run coking coal, f.o.b. W. Pa.	1.40 to 1.50
Gas coal, ¾-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.65 to .75
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.15

Ferromangnaese

	Per Gross Ton
Domestic, 80%, seaboard	*$80.00 to $85.00
Foreign, 80% Atlantic or Gulf port, duty paid	*80.00 to 85.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$28.00 to $30.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	39.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$25.00	13%	$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$21.00	11%	$24.00
7%	21.50	12%	25.00
8%	22.00	13%	27.00
9%	22.50	14%	29.00
10%	23.00	15%	31.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd, carloads	$1.08
Ferrotungsten, less carloads	$1.15 to 1.25
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	24.50c. to 26.00c.
Ferrochromium, 0.06% carbon	26.50c. to 28.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	122.50
Silico-manganese, gross ton, delivered	135.00

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$14.00 to $14.50
No. 2 lump, Illinois and Kentucky mines	17.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	17.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$40.00 to $43.00	$32.00 to $35.00
Maryland	40.00 to 43.00	32.00 to 35.00
New Jersey	40.00 to 43.00	.....
Ohio	40.00 to 43.00	32.00 to 35.00
Kentucky	40.00 to 43.00	32.00 to 35.00
Missouri	40.00 to 43.00	32.00 to 35.00
Illinois	40.00 to 43.00	32.00 to 35.00
Ground fire clay, per ton	6.50	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago	49.00
Birmingham	47.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

MILL PRICES OF BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73
†Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh.	80, 10, 10 and 5
Stove bolts in packages, Chicago.	80, 10, 10 and 5
Stove bolts in packages, Cleveland.	80, 10, 10 and 5
Stove bolts in bulk, P'gh.	80, 10, 10, 5 and 2½
Stove bolts in bulk Chicago.	80, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland.	80, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago	2.85

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c.
F.o.b. Chicago	1.70c. to 1.75c.
Del'd Philadelphia	1.94c.
Del'd New York	1.93c.
F.o.b. Cleveland	1.70c.
F.o.b. Lackawanna	1.75c.
F.o.b. Birmingham	1.80c.
C.i.f. Pacific ports	2.25c.
F.o.b. San Francisco mills	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.75c.
F.o.b. Birmingham, mill lengths	1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.50c. to 1.55c.
F.o.b. Chicago Heights mill	1.60c. to 1.65c.
Del'd Philadelphia	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago	1.70c. to 1.75c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c.
F.o.b. Chicago	1.70c. to 1.75c.
F.o.b. Birmingham	1.80c.
Del'd Cleveland	1.83½c.
Del'd Philadelphia	1.85½c.
F.o.b. Coatesville	1.75c.
F.o.b. Sparrows Point	1.75c.
F.o.b. Lackawanna	1.75c.
Del'd New York	1.93c.
C.i.f. Pacific ports	2.05c.

Structural Shapes

	Base per Lb
F.o.b. Pittsburgh mill	1.65c.
F.o.b. Chicago	1.70c. to 1.75c.
F.o.b. Birmingham	1.80c.
F.o.b. Lackawanna	1.75c.
F.o.b. Bethlehem	1.75c.
Del'd Cleveland	1.83½c.
Del'd Philadelphia	1.76c.
Del'd New York	1.90½c.
C.i.f. Pacific ports	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.65c.
Wider than 6 in., P'gh	1.55c.
6 in. and narrower, Chicago	1.75c. to 1.80c.
Wider than 6 in., Chicago	1.65c. to 1.70c.
Cooperage stock, P'gh	1.70c. to 1.80c.
Cooperage stock, Chicago	1.80c. to 1.90c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.25c.
Strips, Cleveland	2.25c.
Strips, deliv'd Chicago	2.53c.
Strips, Worcester	2.40c. to 2.50c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.40c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland)

To Manufacturing Trade

Bright wire	2.20c. to 2.30c.
Spring wire	3.20c. to 3.30c.

To Jobbing Trade

	Base per Lb.
Smooth annealed wire	2.35c. to 2.45c.
Smooth galvanized wire	2.80c. to 2.90c.
Polished staples	2.35c. to 2.45c.
Galvanized staples	2.60c. to 2.70c.
Barbed wire, galvanized	2.55c. to 2.65c.
Woven wire fence, per net ton	$60.00
	Base per Keg
Standard wire nails	$1.90 to $2.00
Smooth coated nails	1.90 to 2.00
Galvanized nails	3.90 to 4.00

To Retail Trade

	Base per Lb.
Bright wire	2.30c. to 2.40c.
Smooth annealed wire	2.40c. to 2.50c.
Smooth galvanized wire	2.90c. to 3.00c.
	Base per Keg
Standard wire nails	$2.00 to $2.10
Cement coated nails	2.00 to 2.10
Galvanized nails	4.00 to 4.10
	Base per Lb.
Polished staples	2.45c. to 2.55c.
Galvanized staples	2.70c. to 2.80c.
Barbed wire, galvanized	2.65c. to 2.75c.
Woven wire fence, per net ton	$65.00

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh	1.90c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.00c.
No. 10, blue annealed, del'd Phila.	2.19c.
No. 10, blue annealed, B'ham	2.05c.
No. 10, blue annealed, Pacific Coast ports	2.50c.

Sheets

	Blue Annealed Base per Lb.
No. 13, f.o.b. P'gh	2.05c.
No. 13, f.o.b. Chicago dist.	2.15c.
No. 13, del'd Philadelphia	2.34c.
No. 13, blue annealed, B'ham	2.20c.
Box Annealed, One Pass Cold Rolled	
No. 24, f.o.b. Fittsburgh	2.25c. to 2.35c.
No. 24, f.o.b. Chicago dist. mill	2.35c. to 2.45c.
No. 24, del'd Philadelphia	2.54c. to 2.64c.
No. 24, f.o.b. Birmingham	2.50c.
No. 24, c.i.f. Pacific Coast ports	3.00c.
Steel Furniture Sheets	
No. 24, f.o.b. P'gh	3.50c. to 3.60c.
Galvanized	
No. 24, f.o.b. Pittsburgh	2.90c.
No. 24, f.o.b. Chicago dist. mill	3.00c.
No. 24, del'd Cleveland	3.08½c.
No. 24, del'd Philadelphia	3.24c.
No. 24, f.o.b. Birmingham	3.05c.
No. 24, c.i.f. Pacific Coast ports	3.50c.
Continuous Mill Sheets	
No. 10 gage	1.75c.
No. 13 gage	1.90c.
Tin Mill Black Plate	
No. 28, f.o.b. Fittsburgh	2.55c. to 2.65c.
No. 28, f.o.b. Chicago dist. mill	2.65c. to 2.75c.
Automobile Body Sheets	
No. 20, f.o.b. Pittsburgh	3.20c.
Long Ternes	
No. 24, 8-lb. coating, f.o.b. mill:	
Unassorted	3.25c.
Seconds	3.35c.
Primes only	3.45c.
Vitreous Enameling Stock	
No. 24, f.o.b. Pittsburgh	3.70c.

Tin Plate

Base per Box

Standard cokes, f.o.b. P'gh district mills	$5.00
Standard cokes, f.o.b. Gary	5.10

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.30
15-lb. coating I.C.	12.90
20-lb. coating I.C.	14.00
25-lb. coating I.C.	$15.20
30-lb. coating I.C.	16.00
40-lb. coating I.C.	17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1¼% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

Per Gross Ton

Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

Base per 100 Lb.

Spikes, ⅝ in. and larger	$2.70
Spikes, ½ in. and larger	2.70
Spikes, boat and barge	$2.90
Tie plate, steel	1.95
Angle bars	2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49⅛	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	29	15
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

FABRICATED STRUCTURAL STEEL

Pennsylvania Railroad Award of 124,900 Tons Brings Total to 166,000 Tons—New Projects 28,000 Tons

North Atlantic States

PENNSYLVANIA RAILROAD, 124,900 tons, electrification material. Details of award on page 1113-B.

BOSTON, 7500 tons, including 4000 tons of plates, 2500 tons of structural steel, 500 tons of channels and 500 tons of angles, for East Boston tunnel, to Commercial Shearing & Stamping Co., Youngstown.

FRAMINGHAM, MASS., 150 tons, house and other buildings, to Eastern Bridge & Structural Co.

NEW YORK, 200 tons, column cores for reinforced concrete building at 157 Chambers Street, to Levering & Garrigues.

NEW YORK, 400 tons, building at 137 East Fifty-seventh Street, to Paterson Bridge Co.

NEW YORK, 6300 tons, warehouse at Sixty-fourth and Sixty-fifth Streets, to Hay Foundry & Iron Works.

NEW YORK, 1360 tons, armory for 369th regiment, to Harris Structural Steel Co.

NEW YORK, 700 tons, alterations to Lincoln Hospital in Bronx, to an unnamed fabricator.

NEW YORK, 300 tons, flooring for Hudson River Bridge, to Globe Iron Works.

BROOKLYN, 200 tons, Nurses' Home for Green Point hospital, to unnamed fabricator.

CENTRAL ISLIP, N. Y., 125 tons, town hall, to Harris Structural Steel Co.

MENLO PARK, N. J., 170 tons, State hospital for disabled soldiers, to B. Katchen Iron Works, Irvington, N. J.

ROCHESTER, N. Y., 100 tons, Kendall Mills bridge, to a local fabricator.

STATE OF NEW JERSEY, 800 tons, express highway, route 4, section 4, to American Bridge Co.

STATE OF NEW JERSEY, 500 tons, highway bridges, route 4, section 3, to Harris Structural Steel Co.

BUTLER, PA., 150 tons, highway bridge, to Fort Pitt Bridge Works Co.

PITTSBURGH, 150 tons, Knoxville Junior High School, to John Eichleay Co.

The South

NEW ORLEANS, 250 tons, bridge, to Wisconsin Bridge Co.

TEXAS CITY, TEX., 1000 tons, Republic Oil & Refining Co., to Wyatt Metal & Boiler Co.

Central States

WINCHESTER, OHIO, 300 tons, bridge for Chesapeake & Ohio Railway, to American Bridge Co.

PEORIA, ILL., 120 tons, Nuirson Label Co., to Midland Structural Steel Co.

DAVENPORT, IOWA, 385 tons, deck steel for Mississippi River bridge for Rock Island Railroad, to McClintic-Marshall Corpn.

BELLE PLAINE, IOWA, 100 tons, highway bridge, to McClintic-Marshall Corpn.

MILWAUKEE, 250 tons, hospital, to Lakeside Bridge & Steel Co.

WYEVILLE, WIS., 300 tons, bridge for Chicago & North Western, to American Bridge Co.

GASCONADO, MO., 400 tons, bridge, to Stupp Brothers Bridge & Iron Co., St. Louis.

ST. LOUIS, 1000 tons, St. Louis Star building, to Mississippi Valley Structural Steel Co.

ST. LOUIS, 250 tons, 14 pontoons for United States Engineers, to St. Louis Structural Steel Co.

KANSAS CITY, MO., 540 tons, store for Jenkins Music Co., to Kansas City Structural Steel Co.

Western States

SALT CREEK, WYO., 250 tons, two highway bridges, to Omaha Steel Co.

BOISE, IDAHO, 100 tons, bridge over Fall River, to an unnamed fabricator.

NORTH PLATTE, NEB., 365 tons, highway bridge, to Omaha Steel Co.

MACK, COLO., 235 tons, highway bridge, to Minneapolis-Moline Power Implement Co.

ALBUQUERQUE, N. M., 450 tons, bridges at Santa Fe and Farmington for New Mexico Highway Commission, to American Bridge Co.

OAKLAND, CAL., 880 tons, plates, 24 to 36-in. welded steel pipe for East Bay Municipal Utility District, to Steel Tank & Pipe Co.

SAN FRANCISCO, 925 tons, bridges for Western Pacific Co., placed as follows: American Bridge Co., 500 tons; McClintic-Marshall Corpn., 300 tons, and Virginia Bridge & Iron Co., 125 tons.

SAN FRANCISCO, 300 tons, addition to Grace Cathedral, to Judson-Pacific Co.

SACRAMENTO, 109 tons, bridge over Lytle Creek, San Bernardino County, to an unnamed bidder.

LOS ANGELES, 4500 tons, plates; 3000 tons to Western Pipe & Steel Co., and 1500 tons to Consolidated Steel Corpn.

LOS ANGELES, 800 tons, library for University of Southern California, to Consolidated Steel Corpn.

PORTLAND, ORE., 250 tons, addition to Meir & Frank store, to Poole & McGonigle.

PORTLAND, 100 tons, bridge over Tech-kenitch River, to an unnamed bidder.

SEATTLE, 100 tons, sheet steel piling for Federal Building, to Pacific Coast Steel Corpn.

SEATTLE, 100 tons, ship repair work, to Isaacson Iron Works.

OLYMPIA, WASH., 100 tons, bridge over Touchet River, to an unnamed bidder.

BREMERTON, WASH., 300 tons, warehouse for United States Navy, to an unnamed bidder.

LINNTON, ORE., 100 tons, plates, tanks for Valvoline Oil Co., to Steel Tank & Pipe Co.

Canada

MONTREAL, 2500 tons, Dorchester Street bridge, as part of Canadian National Terminal system, to Dominion Bridge Co.

SASKATOON, SASK., 225 tons, subway for Canadian National Railways, to Dominion Bridge Co.

TORONTO, 3000 tons, stable at Exhibition Park for Canadian National Exhibition, to Dominion Bridge Co.

EDMONTON, ALTA., 700 tons, bridge for city, to Canadian Bridge Co.

STRUCTURAL PROJECTS PENDING

North Atlantic States

BOSTON, 9800 tons, Post Office; N. P. Severin Co., Chicago, low bidder on general contract.

TEMBROOK-ALLENTOWN, N. H., 350 tons, State bridge.

SOUTHBORO-FRAMINGHAM, MASS., 430 tons, State bridge.

HINGHAM-HULL, MASS., 250 tons, State bridge.

NEWPORT, R. I., 175 tons, Government assembly building addition.

PORTLAND, ME., 150 tons, Court House addition.

NEW HAVEN, CONN., 300 tons, administration building for Yale University.

NEW YORK, 600 tons, Loew's Theater at Seventy-second Street and Third Avenue.

NEW YORK, 800 tons, underpass on Livonia Avenue, Queens, for Board of Transportation.

NEW YORK, 1500 tons, warehouse on West Side for New York Central Railroad.

NEW YORK, 500 tons, building for Consolidated Gas Co. at Sixty-third Street and York Avenue.

NEW YORK, 300 tons, addition to Seaview Hospital in Borough of Richmond.

NEW YORK, 900 tons, loft building at Grand Concourse and Fordham Road.

JERSEY CITY, N. J., 800 tons, gymnasium for Dickenson High School.

JERSEY CITY, 1000 tons, addition to Y.M.C.A. building.

PHILADELPHIA, 1200 tons, bridge on University Avenue.

LOCK HAVEN, PA., 800 tons, bridge for Pennsylvania Railroad.

BOSTON, PA., 2000 tons, bridge over Youghiogheny River.

WASHINGTON, 4500 tons, American embassy in Paris. Architects, Delano & Aldrich, New York. Bidding open to French and American companies.

WASHINGTON, 1600 tons, Klingle Valley bridge; W. P. Thurston, Inc., Richmond, Va., low bidder on general contract.

The South

BATON ROUGE, LA., 1050 tons, Black River bridge for Louisiana Highway Commission; DeLoot & Ewin, New Orleans, general contractors.

BATON ROUGE, 550 tons, Ouachita River bridge for Louisiana Highway Commission; A. F. Gauger, Memphis, Tenn., general contractor.

Central States

CLEVELAND, 300 tons, factory building for Hardy Co.

CANTON, OHIO, 200 tons, bridge for Pennsylvania Railroad.

LANCASTER, OHIO, 375 tons, building for Hocking Glass Co.

BOARDMAN, OHIO, 125 tons, school.

CLEVELAND, 300 tons, Lorain Avenue bridge for Cleveland Union Terminals Co.

STATE OF ILLINOIS, 800 tons, miscellaneous highway bridges.

CHICAGO, 600 tons, approach to Wabash Avenue bridge.

CHICAGO, 600 tons, bridge over Calumet-Sag Canal.

ST. LOUIS, 7000 tons, approach from East St. Louis to municipal bridge. Low bidder, Mississippi Valley Structural Steel Co.

BARABOO, WIS., 125 tons, State highway spans; Wausau Iron Works, Wausau, Wis., low bidder.

WAUSAU, WIS., 250 tons, Eau Claire River bridge; Wausau Iron Works, low bidder.

MILWAUKEE, 800 tons, T. M. E. R. & L. Co. belt line bridges; bids in.

STATE OF IOWA, 800 tons, highway bridges.

Western States

OKLAHOMA CITY, OKLA., 3500 tons, W. B. Skirvin Hotel.

MERCED, CAL., 500 tons, viaduct over Santa Fe tracks.

LOS ANGELES, 1200 tons, Sixth Street viaduct; bids April 29.

SAN FRANCISCO, 320 tons, Pier 15.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper at 9.75c—Tin Lower—Lead Quiet—Zinc Easier

NEW YORK, March 31

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	Mar. 31	Mar. 30	Mar. 28	Mar. 27	Mar. 26	Mar. 25
Lake copper, New York	10.12½	10.12½	10.12½	10.12½	10.12½	10.12½
Electrolytic copper, N. Y.*	9.50	9.50	9.75	9.75	9.75	9.75
Straits tin, spot, N. Y.	26.75	26.40	.....	26.62½	26.87½	27.12½
Zinc, East St. Louis	3.95	3.95	3.95	3.95	3.95	4.00
Zinc, New York	4.00	4.00	4.00	4.00	4.00	4.35
Lead, St. Louis	4.25	4.25	4.25	4.25	4.25	4.25
Lead, New York	4.50	4.50	4.50	4.50	4.50	4.50

*Refinery quotation, price ¼c. higher delivered in the Connecticut Valley

COPPER

Another price reduction has developed. Yesterday certain custom smelters offered electrolytic copper at 9.75c., delivered in the Connecticut Valley, which compares with 10c., the so-called official price. Primary producers still adhere to the latter quotation and are virtually out of the market. The official quotation of Copper Exporters, Inc., is unchanged at 10.30c., c.i.f. usual European ports. Sales in the past week have been very light, both domestic and foreign. Sales for shipment abroad during March are estimated at about 20,000 gross tons, which is the smallest total in some months. Buying for domestic consumption is confined mostly to nearby needs. Estimates in the trade are that there will be a reduction of something like 10,000 tons in stocks of copper for March.

COPPER AVERAGES

The average price of Lake copper for March, based on daily quotations in THE IRON AGE, is 10.34c. a lb., delivered, New York. The average price of electrolytic copper is 9.87½c., refinery, or 10.12½c., delivered in the Connecticut Valley.

TIN

In a dull market, transactions have been very light, confined to nearby tin, bought mostly by consumers. Prices in general have sagged slightly, with spot Straits tin quoted today at 26.75c., New York. London prices were about £2 a ton less than a week ago, with spot standard quoted at £119 5s., future standard at £120 15s., and spot Straits at £122 2s. 6d. The Singapore price today was £123 7s. 6d. Stocks in British warehouses for the week ended March 28 showed an increase of 425 tons, with the total at 26,834 tons. Deliveries into American consumption for March were 6120 tons and shipments from the Straits to March 28, inclusive, were 6108 tons. Figures for the world's visible supply, available tomorrow, are expected to show a slight decrease from February.

ZINC

During the week quotations for prime Western zinc fell to 3.95c., East St. Louis, or 4.30c., New York, the level reached two or three times in recent months, and the lowest one in many years. Buying by consumers, mostly galvanizers, was heavy on the decline, the total approximating 7000 tons last week. Prices of ore are unchanged at $24 to $25, Joplin, with the volume of business a little larger. The large ore surplus of about 59,485 tons has not been materially reduced.

LEAD

In a quiet market, prices are unchanged at 4.25c., St. Louis, or 4.50c., New York. Demand, which is light, is confined to carload and small orders for nearby delivery. Purchases for April are considerably below consumers' needs.

ANTIMONY

Quotations are lower and Chinese metal is quoted at 7c., New York, duty paid, for spot delivery, with futures at 6.90c.

NICKEL

Wholesale lots of ingot nickel are unchanged at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

ALUMINUM

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, March 31.—Quotations on copper and tin are lower in a quiet market. The old metal market is dull and all prices are lower.

Prices per lb. in carload lots: Lake copper, 10.12½c.; tin, 27.25c.; lead, 4.35c.; zinc, 4.10c.; in less-than-carload lots, antimony, 8.50c. On old metals we quote copper wire, crucible shapes and copper clips, 7.25c.; copper bottoms, 6.25c. to 6.75c.; red brass, 6.25c. to 6.75c.; yellow brass, 4.25c. to 4.75c.; lead pipe, 3.25c. to 3.50c.; zinc, 0.75c. to 1c.; pewter, No. 1, 14.25c.; tin-foil, 15.25c.; block tin, 21.25c.; aluminum, 5.75c. to 6.25c.; all being dealers' prices for less-than-carload lots.

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	17.25c.
*Copper, hot rolled, base sizes	19.87½c.
Seamless Tubes—	
Brass	20.12½c.
Copper	22.37½c.
Brass Rods	15.50c.
Brazed Brass Tubes	25.12½c.

*Extra for cold-rolled, 3c. per lb.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	29.50c. to 30.50c.
Tin, bar	31.50c. to 32.50c.
Copper, Lake	11.25c. to 11.75c.
Copper, electrolytic	11.00c. to 11.50c.
Copper, casting	10.75c. to 11.25c.
Zinc, slab	5.50c. to 6.50c.
Lead, American pig	5.50c. to 6.50c.
Lead, bar	7.50c. to 8.50c.
Antimony, Asiatic	10.00c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	24.00c. to 25.00c.
Alum. ingots, No. 12 alloy	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	19.75c. to 20.75c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	31.25c.
Tin, bar	33.25c.
Copper, Lake	11.63c.
Copper, electrolytic	11.63c.
Copper, casting	11.13c.
Zinc, slab	5.50c.
Lead, American pig	5.25c. to 5.40c.
Lead, bar	8.00c.
Antimony, Asiatic	10.50c.
Babbitt metal, medium grade	15.75c.
Babbitt metal, high grade	35.25c.
Solder, ½ and ½	20.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.00c.	9.00c.
Copper, hvy. and wire	7.75c.	8.75c.
Copper, light and bottoms	6.75c.	7.50c.
Brass, heavy	4.50c.	5.50c.
Brass, light	3.75c.	5.00c.
Hvy. machine composition	6.75c.	7.50c.
No. 1 yel. brass turnings	5.00c.	5.50c.
No. 1 red brass or compos. turnings	6.50c.	7.25c.
Lead, heavy	3.25c.	3.75c.
Lead, tea	2.00c.	2.50c.
Zinc	2.00c.	2.50c.
Sheet aluminum	9.00c.	11.00c.
Cast aluminum	5.00c.	7.50c.

New British Group Urges Consultation with Dominions for Empire Tariff

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(*By Cable*)

LONDON, ENGLAND, March 30.

A GROUP of South Wales industrialists, under leadership of Henry C. Bond, president of the Tin Plate Association, and Frank T. Rees, chairman of the Siemens Steel Association, have agreed to organize the South Wales Council of Industry and Commerce, which will be affiliated with the National Council of Industry and Commerce.

At a recent meeting, this group passed a resolution requesting prompt imposition of tariffs to protect domestic industries, especially agriculture, and suggested that steps be taken to design an Empire fiscal system, following consultation with the Dominions. The meeting further urged drastic national and local economies.

Following its contract a week ago for £73,000 ($354,780) of tin plate placed with the South Wales Tin Plate Corpn., the Soviet Union has closed on further tonnages bringing its total purchase to about 200,000 base boxes, bought on credit terms of about 12 months.

In view of these recent tin plate contracts, it is noteworthy that the Soviet is selling tin plate to Turkey at 10 to 15 per cent under the current market. These tin plates, however, are believed to be oil can sizes manufactured in South Russian mills.

Of the recent Soviet order for electrical equipment placed with Metropolitan Vickers Electrical Co., a substantial part was equipment for blooming and rail mills. In addition to these purchases the Russians are expected to place orders with Clyde shipyards for timber-carrying vessels if the necessary credits can be obtained.

In the second half of February Russian orders in Germany consisted of steel bars and shapes valued at 5,750,000 m. ($1,368,500), steel plates and sheets valued at 1,500,000 m. ($357,000), and steel tubing to a total of 2,000,000 m. ($476,000).

Soviet Union buys 200,000 boxes of tin plate in Wales, meanwhile offering oil can sizes to Turkey at 10 to 15 per cent under market.

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Ford interests in England reported negotiating to buy steel mill to furnish automobile body sheets.

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Japanese competition for Far Eastern steel business brings ocean freight reduction from Continent.

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Japan extends free entry of steel mill equipment for five years more.

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Soviet Union places $3,500,000 aluminum order in Norway.

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German industrialists have reached an agreement with the U. S. S. R. for exclusive shipment to Germany of all manganese ores obtained from recently opened mines in Russia. The German interests are supplying technical management and equipment.

Export markets are influenced by adverse exchange rates, but recent domestic railroad orders booked by British mills have aided business. Continental markets report an improvement in export inquiry. China has bought moderate tonnages of German steel and India, Argentina and the Dutch East Indies are showing increased activity. The Ougree-Marihaye works in Belgium has closed a 7,000,000 fr. contract in the Balkans for rails, fishplates and bolts.

Unconfirmed reports suggest that the Ford interests are negotiating to purchase the Whitford Steel Sheet & Galvanizing Co., which is controlled by the Grovesend Steel & Tin Plate Co. in Glamorgan, South Wales. The Whitford works has furnished automobile body sheets to Morris Motors, Ltd., in the past.

The British market for pig iron is dull, consumers limiting their purchases to early delivery, although inquiry for shipment throughout the month of April is increasing. Hematite iron producers are asking higher prices for forward business to anticipate advancing ore and fuel costs.

Steel business is still inactive with shipbuilding almost suspended. Recently British consumers of semi-finished material have been buying more Continental steel because of the growing possibility of import duties being introduced in the next budget.

In the tin plate market, the production quotas of Welsh mills have been reduced 50 per cent and many mills are idle. Demand for galvanized and black sheets is small.

All groups in the Continental Steel Cartel have agreed in principle to accept the proposal of Luxemburg for control of exports by a quota system.

Belgian production in February was 240,000 tons of pig iron and 222,000 tons of raw steel. Only 44 blast furnaces were active at the end of the month. Czechoslovakian production in February was 98,000 tons of pig iron and 127,000 tons of raw steel.

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Ocean Rates Reduced to Meet Japanese Prices

HAMBURG, GERMANY, March 16.—To meet the rapidly growing competition from Japan in the Dutch

East Indies, the ocean freights from Continental ports have been reduced 10 to 25 per cent on iron and steel products. Similar revisions of freight rates are expected on shipments to Siam, the Straits Settlements and South China ports. Despite the recent decision of the wire rod cartel to maintain prices unchanged, nonmembers and apparently certain members of the cartel have been offering wire rods at £6 8s. ($31.06) a ton, c.i.f. Japanese and Chinese ports.

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German Machine Exports Increased Last Year

HAMBURG, GERMANY, March 16.—Among other German exports last year, textile machinery shipments represented 173,100,000 m. ($41,175,000), compared with 228,700,000 m. ($54,390,600) in 1929, machine tools were valued at 226,600,000 m. ($53,930,800), compared with 210,100,000 m. ($50,003,800) in 1929. Road machinery exports totaled 23,000,000 m. ($5,474,000), oil well equipment 37,160,000 m. ($8,844,080), and papermaking equipment, including pulp mill machinery, 31,100,000 m. ($7,401,806). Of the total machinery exports, Continental consumers absorbed 61.9 per cent, Asiatic users, 19.8 per cent, the Americas, 13.7 per cent, Africa, 3.9 per cent, and Australia, 0.7 per cent.

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Manganese Ore Stocks Reduced in Europe

HAMBURG, GERMANY, March 16.—Stocks of manganese ore, which were large at Rotterdam, Holland, Emden, Germany, and other Continental ports at the end of last year, are gradually declining. This is the result of considerably smaller arrivals from the U. S. S. R., Brazil, Africa and India. Continental consumers of manganese ore have recently bought substantial tonnages, and there is the report that agents of African, Indian and Brazilian mining companies have reached an agreement to discontinue price reductions.

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Norwegian Aluminum for Soviet Union

OSLO, NORWAY, March 9.—The Soviet Union has placed an order with the Norsk Aluminum Co. of Hoyanger, an American controlled interest, for 11,500 tons of aluminum bars, sheets and wire to cost $3,950,000. It is said to be one of the largest single contracts for aluminum ever placed. Credits on the purchase are being guaranteed by the Government of Norway.

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German Blast Furnaces Reduced to 160

HAMBURG, GERMANY, March 16.—The total number of blast furnaces in Germany was reduced by 31 during 1930 to 160, of which 53 were in operation at the end of February, compared with 61 furnaces in operation in January and a total of 95 in blast at the end of February, 1930.

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Japan Extends Free Entry of Steel Mill Equipment

YOKOHAMA, JAPAN, March 8.—The Commercial and Industrial Bureau of the Government has decided to postpone presenting its bill for merger of Japanese steel companies until the next session of the Diet. Meanwhile, as an aid to the steel industry of the country, it has been decided that exemption from duty of machinery and equipment used in steel mills shall be extended for five years from June.

Japan's Iron Imports Mostly from India

YOKOHAMA, JAPAN, March 8.—To meet the competition offered by Indian pig iron, Japanese producers have reduced their quotations below the price of the imported iron. As the Japanese furnaces continue a high rate of output, and the new prices are without profit, their financial loss is considerable. A comparison of Japanese pig iron imports for the past three years shows a predominance of iron from India, as follows in metric tons:

Country of Origin	1930	1929	1928
China	38,361	56,834	30,747
Kwantung	158,642	140,419	182,394
India	236,303	411,477	310,489
Great Britain	4,446	9,133	8,396
Germany	5,309	4,591	6,586
Belgium	224	305	680
Sweden	1,609	814	1,431
United States	1,876	30,473	27,765
All others	69	0	542
Total	447,342	654,055	569,214

The foregoing table shows that Japanese buyers received 52.8 per cent of their imported pig iron requirements from India in 1930, about 63 per cent in 1929 and 54.5 per cent in 1928.

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Rumanian Producers Join Steel Cartel

HAMBURG, GERMANY, March 16.—Rumanian steel producers have been accepted as members of the Central European Steel Cartel, which is a part of the Continental Steel Cartel. Capacity has been greatly expanded in Rumania and all producers are members of the cartel except David Goldberg Sohne at Braila, a German owned plant, which started manufacture of steel sheets, rods and nails in February.

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp with the £ at $4.8665 (par).

British Prices, f.o.b. United Kingdom Ports

Ferromanganese, export	£9	0s.	to	£11	5s.	$43.74	to	$54.75
Billets, open-hearth	5	5	to	5	10	25.52	to	26.76
Black sheets, Japanese specifications	11	10				55.95		
Tin plate, per base box	0	15½	to	0	16	3.77	to	3.89
						Cents a Lb.		
Steel bars, open-hearth	7	17½	to	8	7½	1.71	to	1.81
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	2½	1.66	to	1.76
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Black sheets, No. 24 gage	8	10				1.84		
Galvanized sheets, No. 24 gage	11	0				2.42		

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2	9s.	to	£2	10s.	$11.90	to	$12.15
Billets, Thomas (nominal)	£3	10s.	to	£3	11s.	$17.01	to	$17.25
Wire rods, low C., No. 5 B.W.G.	5	2½	to	5	7½	24.94	to	26.15
Rails, light	6	0				29.20		
Black sheets, No. 31 gage, Japanese	11	5	to	12	12	54.68	to	58.32
						Cents a Lb.		
Steel bars, merchant	3	17	to	3	19	0.83	to	0.85
Beams, Thomas, British standard (nominal)	3	10	to	3	12½	0.78	to	0.80
Channels, Thomas, American sections	5	12	to	5	14	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	3	16	to	3	17	0.82	to	0.83
Angles, Thomas, 3-in.	3	18	to	3	19	0.84	to	0.85
Hoop and strip steel over 6-in. base	4	7½				0.94		
Wire, plain, No. 8 gage	5	0				1.10		
Wire, barbed, 4-pt. No. 12 B.W.G.	9	0				1.91		

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Trend Very Spotty

No Decided Upward Trend in Evidence, Though Slight Gains Are Reported

MARCH has brought no decided upward trend in machine tool orders. Notwithstanding that some sellers have had slightly better business than in February, it is doubted, from the reports now at hand, that the gains of January and February have extended cumulatively into the third month of the year.

The monthly report of the National Machine Tool Builders' Association, which showed quite a marked improvement for February, will be watched for with interest as showing conclusively whether the upward trend of that month has continued.

Reports from the various market centers indicate a very spotty condition. Slight gains in some districts or in some sections of the industry are offset by continued dullness in other territories or branches of the business. A good many sellers report that March business did not exceed that of the previous month. Chicago dealers, however, had a 25 per cent gain in the past month.

Nearly all districts have a fairly large volume of inquiries, but many of these requests for prices do not carry conviction that the orders will be placed until there has been a further improvement in general business conditions.

The Chicago sales total for March was helped by orders in the past week from the Chicago Great Western Railroad and the Illinois Steel Co. The University of Chicago is in the market for about $20,000 worth of tools.

Signs are apparent at Detroit of some revival in demand from the automobile industry, which has been a very poor buyer in recent months. The Chrysler Corpn. is in the market for a considerable number of tools for retooling in connection with transmission changes, particularly for its Dodge Brothers' division. The Oakland Motor Car Co. also is inquiring for some tools.

In export trade the principal purchases recently have been made by the Amtorg Trading Corpn., New York, for shipment to Soviet Russia, and by the Ford Motor Co. for shipment to its European plants. Amtorg has placed a number of sizable orders in the past week. Some of the tools shipped abroad by Ford were taken from the Detroit district plants and rebuilt.

NEW YORK

March machine tool business in the New York district was approximately equal to that of February with most of the dealers and direct representatives. The fact that the gains of January and February have not carried on cumulatively is regarded as a somewhat unsatisfactory indication that no steady uptrend is now to be expected perhaps until after the summer months. There is a good volume of inquiry, but much of it does not carry conviction to sellers that orders will be placed until general business has shown much more improvement than is in evidence or in immediate prospect.

CINCINNATI

Following a slight increase in demand for planers, the machine tool market appears to be stronger. Manufacturers of lathes, on the other hand, report regular lines to be slow, but lighter tools are receiving more attention. Inquiries continue in good number and in some instances users are more disposed to close on receipt of quotations. One manufacturer of planers indicates that a slight increase in the number of employees in his plant will be necessary within the next 30 days as the result of recent orders. These, however, are for single tools and come from the district east of the Mississippi River.

CHICAGO

The last 10 days have proved to be the best part of the month, with the result that the total volume of sales in March exceeded that in February by at least 25 per cent. Orders by the Illinois Steel Co. and the Chicago Great Western, the latter having closed the portion of its list that will be purchased at this time, were largely instrumental in bolstering sales. Inquiries are again more numerous, these being especially noticeable at Milwaukee. The University of Chicago is in the market for about $20,000 worth of machine tools. Dealers have learned that there is no immediate prospect of purchases against the list of the Colorado Fuel & Iron Co. Demand for used machine tools is slowly increasing.

CLEVELAND

Machine tool business was very light the past week and little new inquiry came out. The volume of sales during March was about the same as that in February and the outlook for April is not promising. While manufacturers and dealers have a fair volume of prospects in single machines, many of these inquiries have been pending for some time and little of this business is expected to be

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placed until manufacturing plants get busier. Mill supply business shows quite a gain in both number and size of orders.

MILWAUKEE

While the volume of machine tool sales is still limited, encouragement is found in the fact that gains, however slight, are being made. Production in foundries and machine shops, while still considerably below normal, is slowly extending, furnishing the basis for hopefulness in the tool industry. Inquiry is moderately active, but action thereon continues rather hesitant.

PITTSBURGH

The month is ending with little improvement over February levels. Sales have been in slightly better volume, but new inquiry has decreased and no lists of importance are coming out. Purchases of the Westinghouse Electric & Mfg. Co., East Pittsburgh, mentioned last week, consisted of six boring mills, which will complete its preparations for work on the Pennsylvania Railroad's electric locomotives which is soon to commence. The General Electric Co. also bought tools for its Erie, Pa., plant. The Westinghouse company is contemplating the issuance of a small list during April, and the American Bridge Co. is in the market for a couple of machines for its Ambridge, Pa., plant.

NEW ENGLAND

Dealers continue to report little business in new tools, but state that sentiment in the trade is more hopeful, due to numerous old prospects again inquiring for prices, deliveries, etc. New England machine tool builders, in general, report a falling off in orders. The used tool market is also quiet. The Richard T. Green Co., Chelsea, Mass., marine yards, is inquiring for miscellaneous shop equipment.

While small tool sales are far from active, business is considerably better than in January and February.

The Pneumatic Drop Hammer Co., Boston, reports a marked improvement in busines. It has just shipped a 900-lb. hammer to a Newark, N. J., plant, and a 600-lb. hammer to a Bristol, Conn., plant. Bookings the past week include five hammers of 300 to 900-lb. capacity from a former buyer; one 600-lb. and one 900-lb. hammer from a Lambertville, N. J., company and one 600-lb. hammer from a Taunton, Mass., manufacturer. The company has more inquiries in hand than at any previous time in the past 18 months.

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New York

PLANS have been approved by New York Edison Co., 4 Irving Place, New York, for extensions and improvements in East River electric generating plant, to cost $5,520,000 with equipment. United Electric Light & Power Co., same address, an affiliated organization, will carry out expansion and betterments at Hell Gate electric generating station and other plants to cost $6,329,000 including equipment.

Dorr-Oliver Corpn., New York, is being organized with capital of about $10,000,000 to consolidate Dorr Co., Inc., 247 Park Avenue, manufacturer of chemical and mining plant machinery, filter equipment, etc., and Oliver United Filters, Inc., San Francisco, with main plants at Oakland, Cal., and Hazleton, Pa., specializing in production of filters and filtration equipment. Present plants and personnel will be continued as heretofore. John VanNostrand Dorr, previously head of first-noted company, will be chairman of board; Edwin L. Oliver will be president.

John M. and Theodore H. Miller, Poughkeepsie, N. Y., have organized Giroflyers, Inc., with capital of $25,000, to operate local plant for manufacture of aircraft and parts. Company is represented by Folger & Rockwood, 236 Main Street, attorneys.

In connection with new multi-story Samuel Gompers Industrial High School for Boys in Bronx, New York, revised plans are being made to concentrate on electrical, automobile and machinery trades, rather than develop a general vocational school, as originally planned. Dr. Harold G. Campbell is deputy superintendent of schools. William C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect.

Republic Metals Corpn., New York, recently organized to take over Republic Metals Co., 528 West Thirtieth Street, is planning for early removal to buildings at Green, Freeman and Provost Streets, Brooklyn, where production will be extended to include zinc, lead and other metals, in addition to babbitt and kindred metals. August Salomon, formerly identified with Columbia Smelting & Refining Co., 98 Lorraine Street, Brooklyn, is president.

International Match Corpn., 25 West Forty-third Street, New York, has taken bids on general contract for a new plant at Natchez, Miss., to cost over $100,000 with machinery. It will be occupied by Mississippi Match Co., an affiliated organization. N. W. Overstreet, Jackson, Miss., is architect.

Texas Corpn., 135 Easty Forty-second Street, New York, has authorized a new pipe line from Joinerville to Douglass, Tex., with pumping plant at last noted place, to cost over $200,000 with equipment.

Holston River Power Co., a subsidiary of American Cyanamid Co., 535 Fifth Avenue, New York, has secured an option on over 2000 acres near Kingsport, Tenn., for power development in connection with new electrochemical works of parent organization in that vicinity. Last-noted plant will cost over $15,000,000.

Art Metal Works, Inc., Mulberry Street, Newark, manufacturer of cigar lighters and other metal novelties, has plans for an addition to total about 15,000 sq. ft. floor space, including alterations in present factory. Program will cost over $200,000. Henry Baechlin, 665 Broad Street, is architect.

Montgomery Cylinder & Grinding, 678 Montgomery Street, Jersey City, N. J., operating an automobile engine grinding and repair works, has plans for a new two-story plant, to cost close to $45,000 with equipment.

Ohio Power Shovel Co., Lima, Ohio, a subsidiary of Lima Locomotive Co., same address, has leased building at 317-21 Frelinghuysen Avenue, for a new factory branch, storage and distributing plant. Eastern offices in New York will be removed to new location. Structure is owned by United Rubber Machinery Exchange, which will continue to use part of site.

Fulton Specialty Co., 823 East Jersey Street, Elizabeth, N. J., manufacturer of rubber products and novelties, has purchased local five-story factory unit of Bethlehem Steel Co. and will remodel for new plant, replacing works recently destroyed by fire.

Atco Products Corpn., Scott Avenue and Pennsylvania Railroad Tracks, Rahway, N. J., has taken over plant and business of Atomister Corpn., Rahway, manufacturer of portable electric paint sprayers.

Container Machinery Corpn., manufacturer of tapping, sealing and stitching machinery for corrugated and fiber shipping containers, has leased building at 88 East Kinney Street, Newark, N. J. Fred W. Kucklinsky is president.

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New England

PLANS are being completed by Connecticut Light & Power Co., Hartford, Conn., for new steam power plant at Bristol, Conn., for central heating service, to cost over $100,000 with equipment. Harold A. Hayden, Bristol, is architect.

Boston & Maine Railroad Co., North Station, Boston, has plans for an engine house with repair facilities at Billerica, Mass., to cost close to $50,000 with equipment. Company engineering department, G. A. Kirby, chief engineer, Boston, is in charge.

Boston Consolidated Gas Co., 100 Arlington Street, Boston, has purchased property at Jamaica Plain, making total site of 26,700 sq. ft., with previous holdings, for new equipment storage, service and repair works, to cost over $50,000. Company engineering department will be in charge.

Department of Mental Diseases, Commonwealth of Massachusetts, Boston, has plans for two-story steam-operated electric generating station at Gardner, Mass., to cost close to $100,000 with equipment. Albert B. Franklin, Inc., 25 Haverhill Street, Boston, is engineer.

Board of Education, Boston, will install manual training shops in new three-story school now in course of erection at Jamaica Plain, to cost $700,000. McLaughlin & Burr, 88 Tremont Street, Boston, are architects.

New England Public Service Co., Augusta, Me., is disposing of preferred stock issue to total $3,960,000, part of proceeds to be used for extensions and improvements in power plants and system.

Quartermaster, Springfield Armory, Springfield, Mass., is asking bids until

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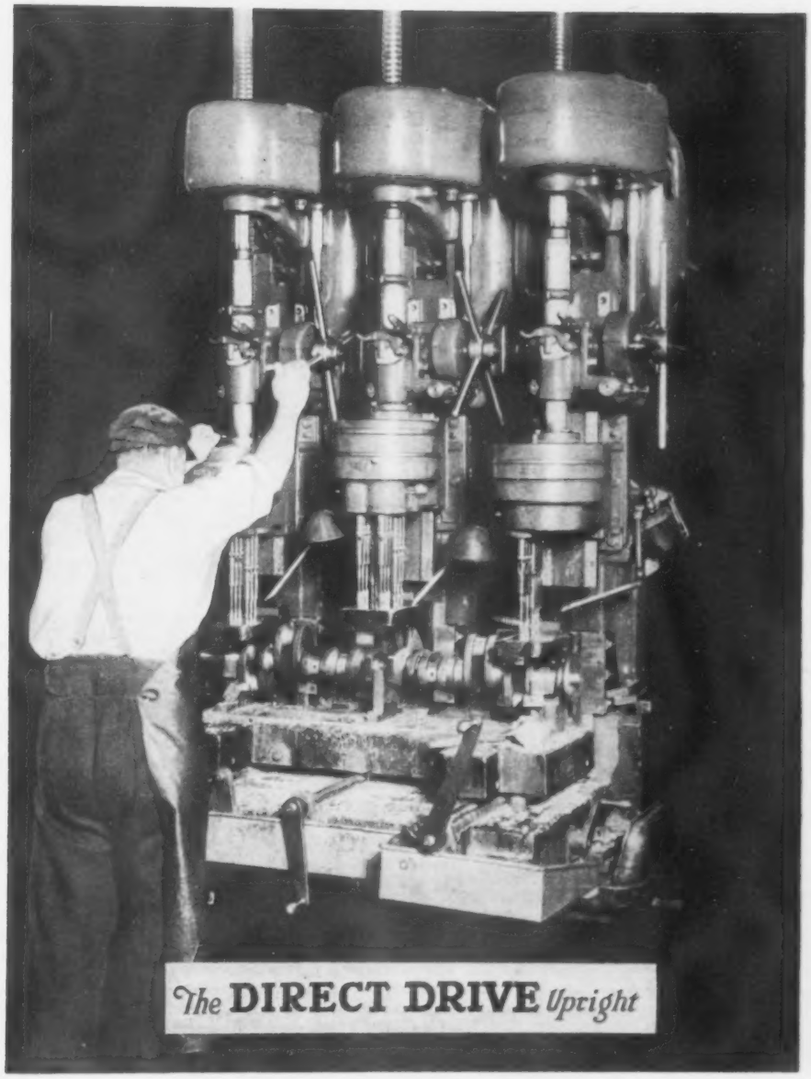

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THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

April 21 for new steam power house at armory, including oil-burning steam power equipment, oil storage facilities, etc.

Gerhard O. Kahler, 72 Granite Street, Boston, manufacturer of metal and wood patterns and kindred specialties, has taken title to three-story factory at 134 Tudor Street, South Boston, for new plant, and will remove to new location.

Machine shop equipment, tools and other machinery of National Railway Signal Co., 69 A Street, Boston, will be offered at public auction on April 7.

Langelior Mfg. Co., Cranston, R. I., is considering erection of a machine shop addition in summer.

Dwight D. Hopkins, South Lee, Mass., lumber box shop, will rebuild a plant in May recently destroyed by fire. Some machine shop equipment is under consideration.

Continental Wood Screw Co., New Bedford, Mass., will build a two-story addition, 50 x 100 ft.

Crane Co., Bridgeport, Conn., is making plant improvements to cost about $10,000 without equipment.

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Philadelphia

PLANS are under way by Standard Oil Co. of Pennsylvania, Ledger Building, Philadelphia, for new bulk oil storage and distributing plant at McKeesport, Pa., including pumping plant and other mechanical units, to cost $100,000. Company engineering department is in charge.

Refrigerator Body & Container Corpn., Seventy-third Street and Elmwood Avenue, Philadelphia, has leased one-story factory, formerly used by Grinnell Co., for a new plant. Grinnell Co. has recently removed to new plant at Erie Avenue and D Street.

Stein Metal Mfg. Co., Philadelphia, recently organized by Joseph Rosenberg, 859 East Hilton Street, and associates, plans operation of local factory for manufacture of metal equipment and appliances for restaurants.

Atlantic Refining Co., 260 South Broad Street, Philadelphia, has arranged for increase in capital of its subsidiary, Atlantic Refining Co., Inc., New York, from $500,000 to $2,500,000, at least $500,000 to be used for expansion of marketing facilities, including bulk storage and distributing plants in western New York.

United States Engineer Office, Wilmington, Del., will receive bids until April 7 for electrical equipment for operating four vertical lift bridges on Chesapeake and Delaware Canal.

Bids are being asked by Bureau of Yards and Docks, Navy Department, Washington, until April 8 for water-softening plant at Philadelphia Navy Yard, including motor-driven pumping machinery, filtering and settling equipment, etc.

Barrett Co., Thirty-sixth Street and Grays Ferry Avenue, Philadelphia, manufacturer of roofing materials, has work under way on new plant at properties of Rocky Dale Stone Co., near Roanoke, Va., to cost over $75,000 with equipment.

Penn Heat Control Co., Philadelphia, has been organized to take over assets and expand Penn Heat Control Corpn., Franklin Trust Building, manufacturer of domestic automatic temperature regulating equipment. General Electric Co., Schenectady, N. Y., is interested in new organization.

Robert N. Mertzler, Schuylkill Haven, Pa., is planning to rebuild automobile body repair and fender works, recently destroyed by fire, with loss over $40,000.

Board of Education, Nineteenth and Ludlow Streets, Philadelphia, contemplates installation of manual training equipment in two new junior high schools, each three stories, to cost over $500,000, for which bids will be asked on general contract this month.

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Buffalo

PROPERTY has been acquired by Sun Oil Co., 1608 Walnut Street, Philadelphia, at Elmira, N. Y., for new bulk oil storage and distributing plant, to cost about $70,000 with equipment. Unit will be operated in conjunction with new pipe line project of Sun Pipe Line, Inc., a subsidiary, in northern New York.

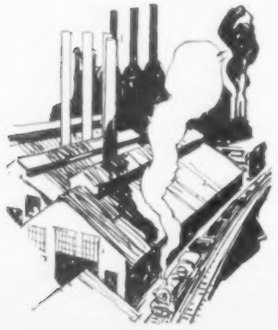
R. O. Gruber, 337 North Drive, Buffalo, and A. R. Habinghurst, 7275 Wentworth Avenue, Cleveland, have organized Niagara Corrugated Container Co., with capital of $50,000, and plan operation of factory at Buffalo for manufacture of corrugated paper, cardboard and fiber containers.

In connection with recent purchase of business of A. Mecky Co., 1705 West Allegheny Avenue, Philadelphia, manufacturer of juvenile vehicles, parts, etc., E. C. Brown Co., Maple Street, Rochester, N. Y., plans early closing of Philadelphia factory and removal to Rochester, where operations will be consolidated at Maple Street works, now given over to manufacture of hardware products, sprayers, etc.

Pretoned Wallboard Corpn., Whitehall, N. Y., recently formed with capital of $125,000, has leased local factory for manufacture of wallboard products.

Fredonia Macaroni Co., Fredonia, N. Y., contemplates installation of conveying machinery and other equipment in connection with rebuilding part of factory recently destroyed by fire, with loss close to $50,000 including equipment.

American Locomotive Co., Dunkirk, N. Y., has discontinued building locomotives at local Brooks plant, which will be given over to manufacture of oil refining machinery, pipe line equipment, heating apparatus. Company has secured large order from Russian Government for oil refining equipment and is now giving employment to largest working force that has engaged at plant in last five years.



Pittsburgh

BIDS will be received until April 7 by Board of Public Education, Mount Lebanon Township, Pa., J. W. Howell, secretary, for shop machinery and tools, steel shelving, laboratory tables and other equipment for high school. Charles L. Wooldridge, Inc., Fulton Building, Pittsburgh, is consulting engineer.

Meadows Mfg. Co., Bloomington, Ill., manufacturer of electric washing machines, parts, etc., has purchased washing machine business of Gainaday Electric Co., 3000 Liberty Avenue, Pittsburgh, a subsidiary of Pittsburgh Gage & Supply Co. Purchasing company plans to concentrate production at Bloomington.

Board of Allegheny County Commissioners, Court House, Pittsburgh, has revised plans for new buildings at airport, including hangar with repair facilities, automobile service, repair and garage building, and administration building, to cost over $200,000 with equipment. Stanley L. Roush, Chamber of Commerce Building, is architect.

McInnes Steel Co., Corry, Pa., has been chartered with a capital of $100,000 to take over plant and business of McInnes Steel Co., Ltd., manufacturer of steel and other metal products. New company is headed by F. E. Whittlesey, E. J. Lewis, Colin McInnes and H. B. Smith.

Pittsburgh Electric Mfg. Co., 6526 Hamilton Avenue, Pittsburgh, has leased three-story building, 56 x 120 ft., at 6375 Penn Avenue, for new plant unit.

Duquesne Light Co., 435 Sixth Avenue, Pittsburgh, is arranging fund of $8,662,140 for extensions and improvements in plants, transmission lines and other work. Equitable Gas Co., same address, an affiliated organization, will expend $1,777,000 during year, including new pipe line construction, drilling new wells and other work. Both companies are subsidiaries of Philadelphia Co.

Pennsylvania Railroad Co., Pennsylvania Terminal, Pittsburgh, has awarded general contract to Rust Engineering Co., Koppers Building, for addition to grain elevator at Erie, Pa., to cost about $200,000, including elevating, conveying, screening and other equipment.

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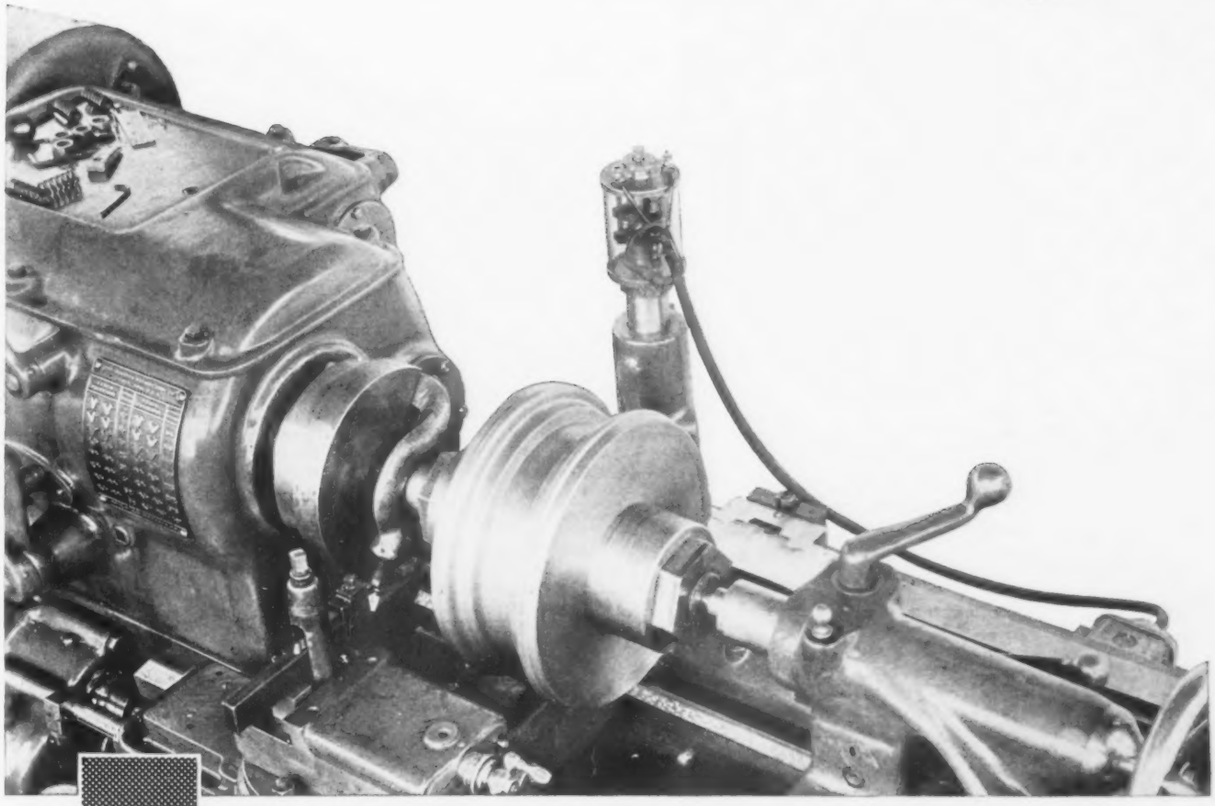
South Atlantic

PLANS are under way by Commonwealth Service Co., Anheuser-Busch Building, Richmond, Va., for a local bulk oil storage and distributing plant, to cost over $75,000 with equipment. Similar plants are proposed in other cities of State. Company was organized recently with capital of $500,000 and is headed by H. E. Watts.

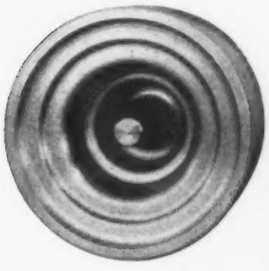
Virginia Public Service Co., Charlottesville, Va., has arranged appropriation of $4,662,000 for extensions and improvements in power plants and system during 1931, of which about $2,786,000 will be used for new construction.

Board of School Commissioners, Anne Arundel County, Annapolis, Md., plans installation of manual training equipment in new high schools at Annapolis and Glen Burnie to cost over $500,000. A bond issue of $1,000,000 recently was voted for these and other county schools. Buckler & Fenhagen, 325 North Charles Street, and W. H. Emory, Jr., Baltimore Trust Building, Baltimore, are architects.



Turn Mill Rolls in Fraction of Usual Time

THE illustration below shows a large die block which was recently machined on a Monarch-Keller Lathe—together with its template. This was a very difficult job and was completed in four hours—from the rough forging to the finished piece as shown. The depth and narrowness of the recess in this die, as indicated by the template, make it a rather difficult job to machine because of the tool clearance and tool overhang. By the old method, it would take an exceptionally competent lathe operator to produce this job in a day.



MOST intricate shapes and parts can be machined quicker, smoother, more accurately and more economically on the Monarch-Keller Form Turning Lathe than by any other method. Jobs that formerly required anywhere from three or four hours to a full working day can now be turned out in from 30 to 60 minutes—with an error of less than .001".

The large mill roll shown in the above photograph is 13" in diameter and 5" wide. It was machined in one hour from the rough forging of high carbon steel. This is a performance that the Monarch-Keller Lathe can keep up all day. Work can be automatically formed to the full swing capacity of the lathe and to the full length between centers.

If you make punches, dies, moulds, circular form cutters, spinning chucks, mill rolls, bending and forming rolls, can forming dies, formed milling cutters, irregular (circular or oval) shapes—investigate the outstanding advantages of the Monarch-Keller Form Turning Lathe.

Let the Monarch Research Department run a test for you on difficult jobs you are now doing. Send us some blanks and a blue print. Our report on the test will interest you. There is no obligation.

Bulletin 145 will give you the facts.

THE MONARCH MACHINE TOOL CO., Sidney, Ohio, U.S.A. New York Sales Office: 857 Graybar Building

Monarch Lathes

Helical Gears - Timken Bearings

SMOOTHER..QUIETER..MORE POWERFUL

American Paper Bag Co., Inc., 602 North Seventh Street, Richmond, Va., manufacturer of heavy kraft paper bags and containers, has acquired building formerly occupied by Republic Paper Products Co., Highland Park district, and will purchase equipment at once for new plant, to develop initial capacity of about 600,000 units daily.

Engineer, Third Corps Area, 311 St. Paul Place, Baltimore, will receive bids until April 10 for erection of one rigid steel tower at Fort Monroe, Va.

City Council, Aiken, S. C., is considering early call for bids for extensions and improvements in municipal electric light and power plant, including additional equipment. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is engineer.

Emerson Engineering Corpn., Alexandria, Va., has been organized to consolidate American Pump & Valve Co., with local plant on Merchant Street, and Aresto Co., Union Avenue, Baltimore, manufacturer of non-explosive tanks, flame arresters, etc. Both lines of production will be continued and large part of output will be concentrated at Alexandria plant. E. A. Johnson is president of new company.

General Purchasing Officer, Panama Canal, Washington, will receive bids until April 14 for quantity of copper-clad steel wire, high-tension suspension insulators, splicing sleeves, ground-wire clamps, hangers and other equipment; also, until April 10, for 50 gas accumulators, disconnecting switches, lightning arresters, etc.

Department of Public Buildings and Public Parks, Washington, Lieut.-Col. U. S. Grant, 3d, director, is planning new steam power plant for central heating service, 91 x 180 ft., to cost over $500,000 with equipment. D. H. Gillette is chief engineer of department, in charge.

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Chicago

BIDS have been asked on general contract by Edward Katzinger Co., 1949 North Cicero Avenue, Chicago, manufacturer of tin and metal ware products, for a two-story addition, 210 x 220 ft., to cost more than $175,000 with equipment.

W. C. Grunow, formerly president of Grigsby-Grunow Co., 5801 Dickens Avenue, Chicago, manufacturer of radio equipment, refrigerators, etc., has opened executive offices at 221 North La Salle Street and is organizing company to manufacture radio apparatus, television equipment and kindred precision equipment. Local plant will be secured for initial production. Several officials of Grigsby-Grunow organization will be identified with new company, including Herbert E. Young, H. H. Bailey, Dr. J. D. Jordan and M. W. Kenney. Mr. Kenney was formerly chief radio and refrigeration engineer for company noted.

State Board of Education, Des Moines, Iowa, has taken bids on general contract for a three-story mechanical engineering laboratory at State university, Iowa City, 72 x 150 ft., to cost about $75,000.

Crystal Ice Co., Sioux City, Iowa, will remodel building at Des Moines, Iowa, for a new ice-manufacturing plant, to cost about $80,000 with equipment.

Arrowhead Light & Power Co., Cook, Minn., is considering extensions in steam-operated electric power plant, including installation of a new steam engine unit and auxiliary equipment.

Bureau of Reclamation, Denver, is asking bids until April 8 for one motor-driven vertical pumping unit with accessories.

Ace Fastener Corpn., 3419 North Ashland Avenue, Chicago, recently organized by Henry B. Floyd and J. Glen Jacobs, with capital of $24,000, plans operation of local factory for manufacture of stapling devices, metal fasteners and kindred products.

Buehler Brothers, Inc., 1414-20 West Forty-sixth Street, Chicago, meat packer, has plans for two-story addition, 84 x 100 ft., with refrigerating machinery, conveying and other equipment to cost close to $100,000. H. C. Christensen, 222 West Adams Street, is architect.

Edward Graff and E. Fritz have organized Quality Auto Parts Corpn., 1307 South Michigan Avenue, Chicago, with capital of $20,000, and plan operation of factory for manufacture of automobile parts and kindred products.

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Detroit

PLANS have been filed by Kalamazoo Foundry & Machine Co., Kalamazoo, Mich., for a one-story addition, 36 x 145 ft., to cost over $45,000 with equipment.

City Council, Bay City, Mich., is considering erection of a municipal steam power plant, to cost over $100,000 with equipment. Hamilton & Webber, Grand Rapids, Mich., are engineers.

Board of Education, Manistique, Mich., plans installation of manual training equipment in new junior high school to cost about $200,000, for which bids are being asked on general contract until April 21. R. V. Gay, St. Johns, Mich., is architect.

Bon Dee Golf Ball Co., 5626 McGraw Avenue, Detroit, is planning to rebuild part of plant recently destroyed by fire, with loss about $70,000 including equipment. Stanley B. Nicholas is treasurer.

Pierson Abrasive Disc Co., 415 Capitol National Bank Building, Lansing, Mich., recently organized, plans operation of local plant for manufacture of abrasive products. D. W. Atkinson, 234 Mount Vernon Street, Grand Rapids, Mich., and E. H. Pierson, Lansing, are heads.

Hupp Motor Car Corpn., 3641 East Milwaukee Street, Detroit, is remodeling factory at Windsor, Ont., for new branch assembling plant, totaling about 30,000 sq ft. floor space.

Spring Lake Ice Co., Grand Haven, Mich., is considering new artificial ice-manufacturing plant at Ferrysburg, Mich., to cost about $45,000 with machinery.

L. J. Stevenson, Holland, Mich., and associates have organized Dunphy Boat Mfg. Co. and will establish headquarters at Eau Claire, Wis., where boat-building and repair plant will be operated. Another works is proposed at Ottawa Beach, Holland. James Larsen, Eau Claire, is interested in new company.

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Cincinnati

CONTRACT has been let by Jaeger Machine Co., 520 Dublin Avenue, Columbus, Ohio, manufacturer of road-building machinery, contractors' equipment, etc., to Theodore J. Schirtzinger, 1353 North High Street, for one-story addition to cost about $40,000 with equipment. Bassett & Tresselt, 527 East Broad Street, are architects.

Conveying machinery, power and other mechanical equipment will be installed in addition to plant of Crowell Publishing Co., Springfield, Ohio, to cost over $500,000.

Chris Erhart Foundry & Machine Co., Cincinnati, has been organized to take over and expand company of same name with plant at 1237 West Sixth Street. New organization is headed by Charles C. and Thomas H. Erhart.

City Council, Mount Sterling, Ky., has plans for a municipal electric light and power plant, to cost over $70,000 with equipment. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is consulting engineer.

Columbus Independent Ice Co., 85 East Gay Street, Columbus, Ohio, contemplates new artificial ice-manufacturing plant, to cost close to $65,000 with machinery. Walter M. Zuber is head.

United States Engineer Office, Memphis, Tenn., is asking bids until April 8 for one steam-operated band grader dragline machine.

Plant and properties of Scioto Valley Railway & Power Co., Columbus, Ohio, have been acquired by American Electric Securities Corpn., 43 Cedar Street, New York. Scioto properties are valued in excess of $6,000,000 and will be operated as a unit of purchasing company, which plans to carry out expansion and improvements.

Board of Education, Bexley, Ohio, John Hanney, 311 South Columbia Avenue, clerk, plans installation of manual training equipment in new high school to cost about $350,000. Miller & Reeves, 203 East Broad Street, Columbus, Ohio, are architects.

Board of Education, Ludlow, Ky., plans installation of manual training equipment in new three-story and basement junior high school to cost $185,000, for which bids will soon be asked on general contract. Frederick H. Porter, A. I. U. Building, 50 Broad Street, Columbus, Ohio, is architect.

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St. Louis

PLANS are under way by Slack Petroleum Co., Tulsa, Okla., for a new oil refinery at Longview, Tex., with initial capacity of 2500 bbl. daily, to cost about $120,000 with machinery.

Van Buren Light, Power & Ice Co., Ellington, Mo., is considering rebuilding part of power plant recently destroyed by fire with loss close to $40,000 including equipment.

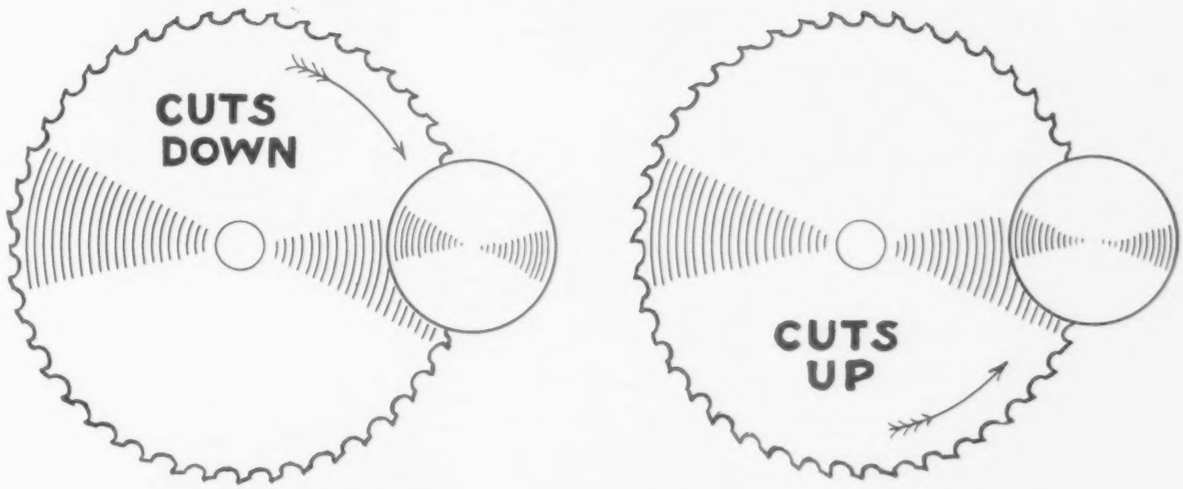
Missouri Portland Cement Co., Cement City, Mo., has awarded contract to Havens Structural Steel Co., Seventeenth Street and Crystal Avenue, Kansas City, Mo., for extensions and improvements, to cost over $75,000 with equipment.

City Council, Perryville, Mo., has plans for a municipal electric light and power plant, to cost over $75,000 with machinery. Russell & Axon, 6200 Easton Avenue, St. Louis, are consulting engineers.

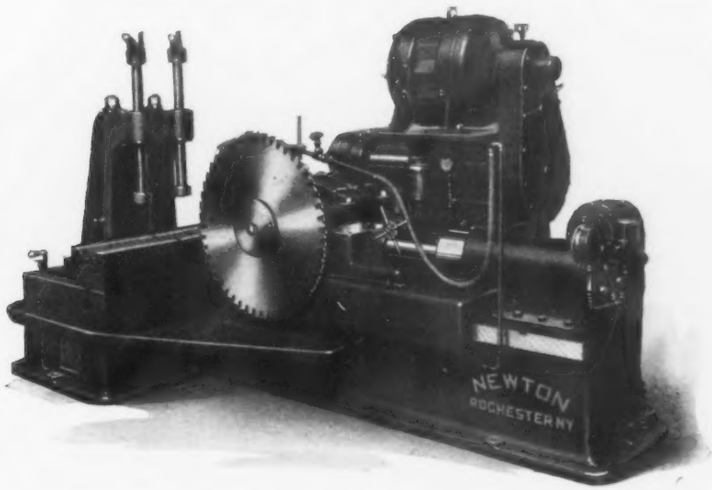
North American Car Co., Coffeyville, Kan., builder of railroad cars, plans rebuilding part of local works destroyed by fire March 27, with loss more than $150,000 including equipment.

Motor Tool Co., Nebraska City, Neb., contemplates one-story plant for manu-

It makes a big difference In results— Whether the saw blade



The New **NEWTON** Hydraulic Feed Cold Saw CUTS UP and this principle of design, plus Hydraulic Feed has produced results which are simply amazing, as compared with average production on the old type cold saws. There are other excellent reasons for the remarkable production figures following:



Cutting S. A. E. 1040
9″ diameter rounds
in 3½ minutes

Cutting .60 to .70
Carbon Steel
5¼″ diameter in
2⅓ minutes

Compare these figures with your present production.

Write for Bulletin giving full details.

BETTS-NEWTON-COLBURN-HILLES & JONES-MODERN

CONSOLIDATED

CONSOLIDATED MACHINE TOOL CORPORATION *of* AMERICA, Rochester, N. Y.

facture of tools and other equipment, to cost close to $22,000 with machinery.

Kansas Elevator Co., Salina, Kan., Harry Robinson, president, has asked bids on general contract for an addition to grain elevator at Topeka, Kan., including screening, conveying, elevating and other equipment, to cost over $85,000. I. L. Zerbe, 140 South Santa Fe Avenue, Salina, is architect and engineer.

T. J. Moss Tie Co., Security Building, St. Louis, is considering new plant at Springfield, Mo., including machine shop, power house and mill, to cost over $50,000 with equipment. Roy Chitwood is general manager.

City Council, Hominy, Okla., will call for bids soon for new municipal electric light and power plant, to cost about $150,000 with equipment. V. V. Long & Co., Colcord Building, Oklahoma City, Okla., are consulting engineers. G. H. Blackwood is city clerk.

Missouri-Kansas-Texas Railroad Co., Railway Exchange Building, St. Louis, has awarded general contract to James Stewart Corpn., 343 South Dearborn Street, Chicago, for new grain elevator at Kansas City, Mo., to cost $250,000 with elevating, conveying, screening and other mechanical equipment.

James R. Kearney Corpn., 4230 Clayton Avenue, St. Louis, manufacturer of underground and overhead electrical equipment and safety tools for handling high-tension wires, has let a contract to Humes-Deal Co. for three-story addition, containing 30,000 sq. ft. of floor space.

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Cleveland

A NEW slag grinding, storage and distributing plant at Hollidays Cove, Pa., to cost close to $40,000 with equipment, is under consideration by Standard Slag Co., Youngstown, Ohio.

Lima Sheet Metal Products Co., Lima, Ohio, has awarded general contract to H. U. Tuttle, Lima, for one-story addition, 60 x 115 ft., to cost about $65,000 with equipment.

Cleveland Packless Pump Co., Beachwood, Ohio, care of Louis Vinocur, 837 Leader Building, Cleveland, has been organized to operate a plant at Beachwood for manufacture of pumping machinery and parts. Daniel H. Wasserman is one of organizers.

Board of Education, Tuscarawas County, New Philadelphia, Ohio, plans installation of manual training equipment in new two-story and basement senior and junior high school at Sugarcreek, to cost about $150,000 with equipment. C. J. Marr, New Philadelphia, is architect.

Municipal Water Works Commission, Lorain, Ohio, is considering installation of electric-operated pumping machinery at city waterworks, to replace present steam-driven equipment; also erection of a storage tank of 1,250,000-gal. capacity.

Warner M. Bateman, 5403 Prospect Avenue, Cleveland, local representative for Reo automobile, is planning new two-story service, repair and sales building, 110 x 130 ft., to cost over $100,000 with equipment.

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Milwaukee

MANUFACTURE of portable, gas-fired incinerators for domestic and industrial uses will be started about April 15 by newly organized Incinor Corpn., Milwaukee, formed by Arnold A. Naulin, formerly president of Home Incinerator Co., Milwaukee. Offices are at 174 West Wisconsin Avenue, and manufacturing arrangements are now being completed. Mr. Naulin is president, and W. A. Sandrock, secretary and treasurer.

Board of Education, Ellsworth, Wis., has commissioned Jacobsen & Jacobsen, architects, 212 Wesley Temple Building, Minneapolis, to design a new high school with vocational facilities, first unit to cost $75,000. Bids will be taken after May 1. J. S. Pitts is city superintendent of schools.

Bids are being taken until April 10 by H. W. Warner, village clerk, Oakfield, Fond du Lac, Wis., for a municipal waterworks plant and system. Equipment includes one 350-gal. per min. general service pump; one 500-gal. auxiliary pump with 6-cylinder gasoline engine drive, and one 350-gal. deep well turbine pump. Specifications also call for one 60,000-gal. steel tank and tower. Plans are by McMahon Engineering Co., Menasha, Wis.

Holt Electric Mfg. Co., 423 West Pierce Street, Milwaukee, has changed its name to Holt Electric Motor Co., to better identify its principal activity. Company specializes in rebuilding motors and rendering a general industrial and sales service.

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Gulf States

IN connection with new oil refinery of East Texas Refining Co., Longview, Tex., now under way, company has authorized plans for a second unit of similar capacity, 6000 bbl. daily, to cost over $150,000. Project will include a new pipe line from Lathrop oilfields to refinery, with pumping station and other facilities.

Thrift Packing Co., 3914 Pacific Street, Dallas, Tex., is considering new one-story canning plant, 150 x 200 ft., near Palestine, Tex., to cost over $50,000 with machinery.

Highway Steel Products Co., Chicago Heights, Ill., manufacturer of steel road strips, welded mesh supports, steel joints and other contractors' equipment, has leased property at 4401 Morris Avenue, Birmingham, for new branch plant.

Hydro-Plant Corpn., San Antonio, Tex., care of L. E. Rush, Western Life Insurance Building, recently organized with D. J. Little as president, has purchased property as a site for new plant for production of hydraulic machinery, hydraulic pumps and kindred heavy equipment, with departments for parts manufacture and assembling, to cost over $100,000 including equipment.

Magnolia Petroleum Co., Dallas, Tex., an interest of Standard Oil Co. of New York, 26 Broadway, New York, contemplates extensions and improvements in plant at Lubbock, Tex., to cost close to $50,000 with equipment.

Texas Automatic Sprinkler Co., Santa Fe Building, Dallas, manufacturer of sprinklers and sprinkling equipment, has awarded general contract to W. H. Reeves, 3310 Commerce Street, for one-story plant, 95 x 100 ft., to cost about $35,000 with equipment. Lang & Witchell, First National Bank Building, are architects.

Derrick & Equipment Co., Shreveport, La., manufacturer of oil well equipment, rigs, etc., is considering one-story plant, 60 x 100 ft., to cost about $25,000 with equipment. H. D. Gray is president.

City Commission, Amarillo, Tex., has arranged fund of $1,000,000 for installation of natural gas distributing system, including compressor stations and other equipment, and will begin work soon. City engineering department will be in charge.

United States Potash Co., an interest of Monolith Portland Cement Co., Bartlett Building, Los Angeles, contemplates a new refinery near Carlsbad, N. M., where company has sunk shaft and has preliminary plant for production of potash salts. Borax Consolidated, Ltd., London, England, is interested in project, which will cost over $750,000 with equipment.

Moody-Seagraves Corpn., Esperson Building, Houston, Tex., contemplates an oil pipe line from vicinity of Joinerville, Rusk County, to point on Gulf coast, to cost over $250,000 with pumping stations and other equipment. Company has secured a gas franchise at Eustis, Fla., and vicinity, and contemplates installation of artificial gas plant and system to cost about $300,000.

Republic Oil & Refining Co., Houston, Tex., has plans for a new oil refinery, including bulk oil storage and distributing plant at Texas City, to cost close to $1,000,000 with equipment. Project will include a pipe line for oil supply from Big Lake oilfield, Reagan County; a gasoline cracking plant will be installed.

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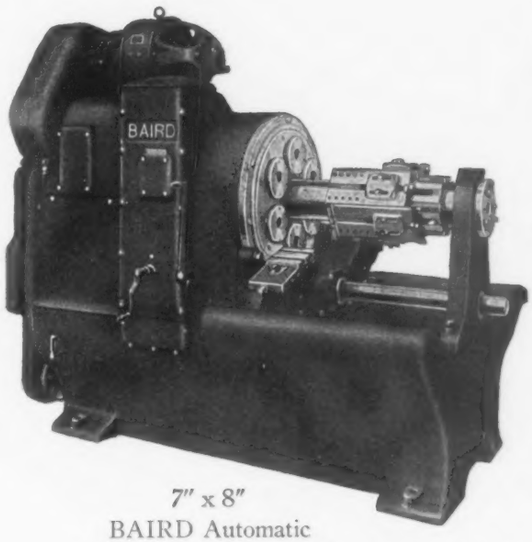
Indiana

CONTRACT has been let by George J. Mayer Co., 142 South Meridian Street, Indianapolis, manufacturer of metal stampings, etc., to William Van Landingham, Lemcke Building, for one-story addition, 46 x 76 ft., to cost about $19,000 with equipment. Vonnegut, Bohn & Mueller, Indiana Trust Building, are architects.

Board of County Commissioners, Court House, Bloomington, will soon take bids for an addition to power plant at county jail, to cost over $40,000 with equipment. Alfred Grindle, Bloomington, is architect.

Harrah Mfg. Co., Bloomfield, manufac-

PRECISION MACHINING WITH UTMOST ECONOMY



7" x 8"
BAIRD Automatic
Multiple Spindle Lathe for Chucked Work

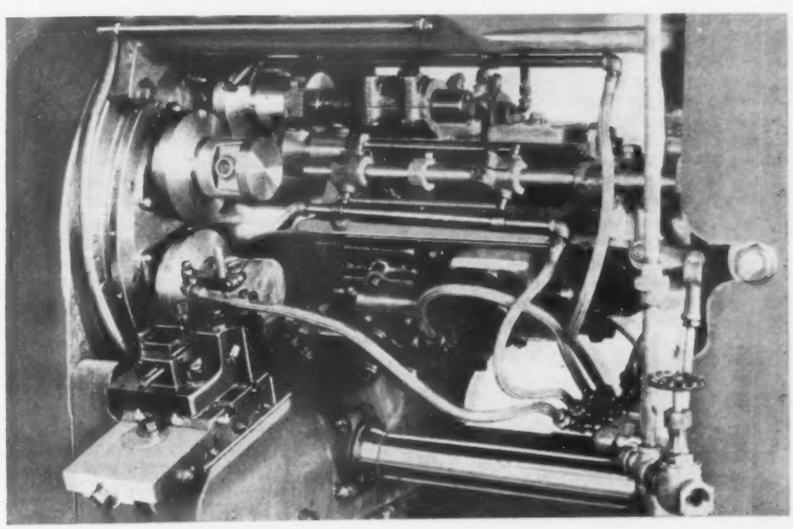
The efficiency of any machine may be accurately judged by the quality, quantity and precision of parts produced.

BAIRD Automatic Multiple Spindle Lathes are continually proving their efficiency on many complicated machining operations, where precision is a vital factor. Many special features effect unusual economies on Chucked or Centered Work.

The illustration below shows automobile piston set up on a BAIRD Horizontal Six Spindle Lathe. Floor to floor time for each piston, 15 seconds up, rough and finish turned and grooved in one operation.

AUTOMATIC BAIRD MACHINERY

"Ask BAIRD About It"



Safety Controls.

Starting and Stopping of Machine is AUTOMATIC.

Least Amount of Manual Labor or Attention While in Operation.

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BRIDGEPORT, CONNECTICUT

▲ ▲ Business as Others See It

Digest of Current Financial and Economic Opinion ▲ ▲

PAINFULLY slow, the words of one commentator, appears to be the consensus of opinion regarding our forthcoming emergence from the doldrums. That the recovery is already under way, though haltingly, is the general view. Even those pessimistically inclined see a break in the clouds, but those of hopeful spirits sound many words of caution—lest we expect too much and suffer further disappointment.

Increasing payrolls, greater building activity, manufacturing gains, just beginning to be reflected in better car loadings—these and many other "straws" point the way onward and upward. But discouraging factors are not absent, either here or abroad. The change in the wheat situation, on withdrawal of Government support, is a case in point; abroad, it is the complications from the Austro-German "Anschluss."

Recovery here will have to proceed without regard to Europe, in one considered opinion, which sees "European economic stability precariously perched" upon a "volcano of political passion."

But irregular advances, becoming in February more than seasonal in some lines, are blazing the way. Brookmire's business index, allowing for seasonal factors, turned up in February—the first time in almost a year. The advance over January was only 1 per cent and it "does not necessarily mean that a strong upward tendency will now at once set in. In fact, there may be some fluctuation near the present level."

That economic service expects—after some months—"a general improvement which will carry our business index across the normal line some time in 1932. The exact development cannot be predicted. Much depends on the trend of commodity prices. . . . Irregularity in the advance is likely, but need not obscure the fact that we are making the turn."

Continuance of poor buying power is a disturbing factor. Silberling stresses this and notes "a tendency for rather marked further recessions in the agricultural areas. . . . Several of the most comprehensive and reliable indicators still fail to reflect recovery. Check transactions, car loadings and production of electric power all showed no significant gains in February." Subnormal precipitation is certain to aggravate the rural trouble.

Guaranty Trust Co. of New York sums up the situation thus: "Evidence accumulates that the way is being cleared for business recovery and that the necessary readjustments to assure it are under way, but that this will be a slow and uneven process seems equally evident." That bank's business index went up 1½ per cent in February, after having been virtually stationary since November. Union Trust Co., Cleveland, reports still better gains.

With more than the customary seasonal advance in manufacturing activity and with a coincident advance in the prices of a list of "sensitive commodities," Harvard Economic Society thinks that "a cyclical upturn in commodity prices" may be indicated, despite the continued sagging of general price levels. "Coming at a time of depression, the recent upturn in the sensitive index may forecast a check to the decline."

turer of door checks and kindred hardware products, has awarded general contract to L. O. Cooper, Bloomfield, for three one-story plant units, 38 x 115 ft., 38 x 76 ft., and 50 x 50 ft., to cost over $45,000 with equipment. One of smaller structures will be used for office service.

Sibley Machine Works, South Bend, has awarded general contract to Ralph Sollitt & Son Co., South Bend, for one-story foundry addition, 80 x 100 ft., to cost about $40,000 with equipment. Frank D. Chase, Inc., 720 North Michigan Avenue, Chicago, is architect and engineer.

Board of Education, Mackey, contemplates installation of manual training equipment in new two-story and basement high and grade school to cost $165,000, for which plans will be drawn by Sutton & Routt, Vincennes, architects.

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Pacific Coast

PLANS have been authorized by Board of Education, Pasadena, Cal., for a one-story addition to mechanical shop unit at Pasadena junior college, including improvements in present structure, to cost about $45,000. Frederick Kennedy, Jr., 15 South El Molino Street, is architect.

Williams Brothers, 142 West Front Street, Norwalk, Cal., grain, have awarded general contract to J. W. Owsley, 130 West Spruce Street, for a new milling plant and elevator, to cost $100,000 with elevating, conveying, screening and other equipment.

Nevada-California Electric Corpn., Riverside, Cal., is disposing of a bond issue of $2,000,000, considerable part of fund to be used for extensions and improvements in properties. Company has secured contract for furnishing power for construction of Hoover Dam at Boulder Canyon, and has begun steel tower transmission line from San Bernardino, Cal., to that place, 230 miles, to include power substation and switching stations, and other operating facilities.

Southern California Edison Co., Los Angeles, has authorized extensions in high-tension transmission lines in Los Angeles and Orange Counties, including steel tower lines, to cost over $1,000,000.

United States Indian Irrigation Service, Federal Building, Yakima, Wash., is asking bids until April 10 for machinery for a power substation, motor, etc.

Rainier Ornamental Iron Works, Seattle, has leased one-story building, 80 x 112 ft., to be erected at 4021 South Eighth Street, and will occupy for a new shop.

Tea Garden Products Co., 755 Sansome Street, San Francisco, manufacturer of food products, has awarded general contract to Austin Co., Seattle, for new three-story factory, storage and distributing plant at Seattle, 90 x 132 ft., to cost $250,000 with equipment, including conveying and other handling apparatus.

Weber Showcase & Fixture Co., 5700 Avalon Boulevard, Los Angeles, has purchased controlling interest in American Woodworking Corpn., 2800 Twentieth Street, San Francisco, and Rogers Cabinet Mfg. Co., Seattle, and will operate as subsidiaries. Name of San Francisco interest will be changed to Weber American Co., and Seattle organization to Weber Rogers Co.

Canada

TOWN council, Grand Falls, N. B., contemplates purchase of equipment for electric light and waterworks plants, to cost $20,000. F. W. Pirie is mayor.

Town council, Campbellton, N. B., is considering erection of an electric power plant to cost $70,000. J. T. Reid is clerk.

Hydro-Electric Commission, St. Thomas, Ont., is planning to renew equipment in Edgewood Road substation at a cost of $18,000. J. W. Peart, Talbot Street, is superintendent.

Anchor Cap & Closure Corpn., Long Island City, N. Y., is negotiating for a 12-acre harbor site at Hamilton, Ont., for erection of a plant. J. O. Deegan, 275 Wallace Avenue, Toronto, is Canadian manager.

Western Bridge Co., Ltd., foot of Columbia Avenue, Vancouver, B. C., will build a plant addition to cost $500,000.

H. C. Rose, Clerk, Durham, Ont., is receiving bids until April 6 for erection and equipment of a waterworks plant.

City Gas Co., 215 Dundas Street, London, Ont., is planning to spend $1,000,000 this year on erection of buildings, a gas holder and purchase of equipment.

Studebaker Corpn. of Canada, Ltd., Walkerville, Ont., contemplates plant addition and installation of equipment for manufacture of trucks. D. R. Grossman is general manager.

Bids will be called early this month for a waterworks pumping plant and equipment at Westboro, Ont., to cost $35,000. Robert Gamble is clerk; James, Proctor & Redfern, Ltd., 36 Toronto Street, Toronto, is engineer.

Haynes Stellite Engineering Service

A Customer's Viewpoint . . .

A PROMINENT manufacturer writes: We had a problem on our hands. It is our experience that the element of chance which enters into the hardening of steel cutting tools invariably shows an alarming percentage of waste. A tool improperly hardened has to be ground more often, and the result is a serious loss in production. Your engineers made several sound suggestions which proved invaluable in bringing greater efficiency and real economy into our shop. Haynes Stellite cutting tools were found to be more practical on many machining operations . . . heat treatment was eliminated . . . less grinding was required . . . and the tool cost per unit piece machined was considerably reduced.

Haynes Stellite cutting tools are inherently hard and maintain practically the same degree of hardness at red heat. Therefore, these tools will operate at speeds at which hardened tools fail.

Write today for further information. Fill out and return the coupon.

HAYNES STELLITE TRADE MARK

An Alloy Cutting Tool of Chromium, Cobalt and Tungsten

HAYNES STELLITE COMPANY

Unit of Union Carbide UCC *and Carbon Corporation*

CHICAGO DETROIT LOS ANGELES SAN FRANCISCO
CLEVELAND HOUSTON NEW YORK TULSA

General Offices and Works—Kokomo, Indiana

Haynes Stellite Welding Rod is also available from any of the 42 Oxweld shipping points of The Linde Air Products Company

HAYNES STELLITE · HAYSTELLITE · HASCROME · HASTELLOY

Quality Products, Fair Prices, Dependable Supply, Engineering Service

Haynes Stellite Company, Kokomo, Indiana

Without obligation on my part, please send me further information on "Haynes Stellite Service and Cutting Tools."

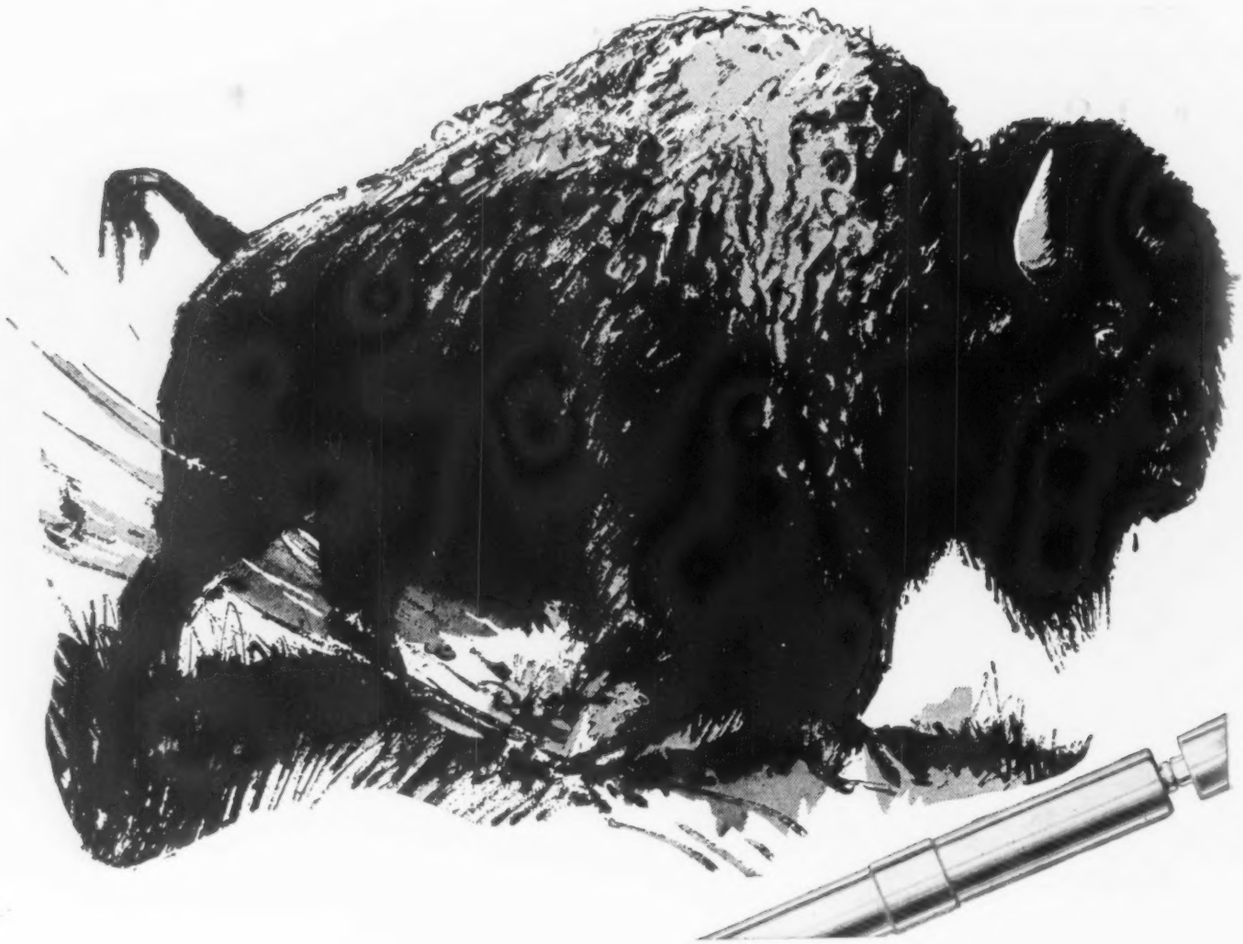
Name.....

Company.....Position.....

Street Address.....

City.....State.....

See Booth No. 93—13th Exposition Chemical Industries—New York, May 4-9



As AMERICAN as this

The P & W Jig Borer was conceived in the P & W plant in Hartford, Conn. American brains designed it. American hands built it. It is only one of the many splendid contributions New England has made to the metal working industry.

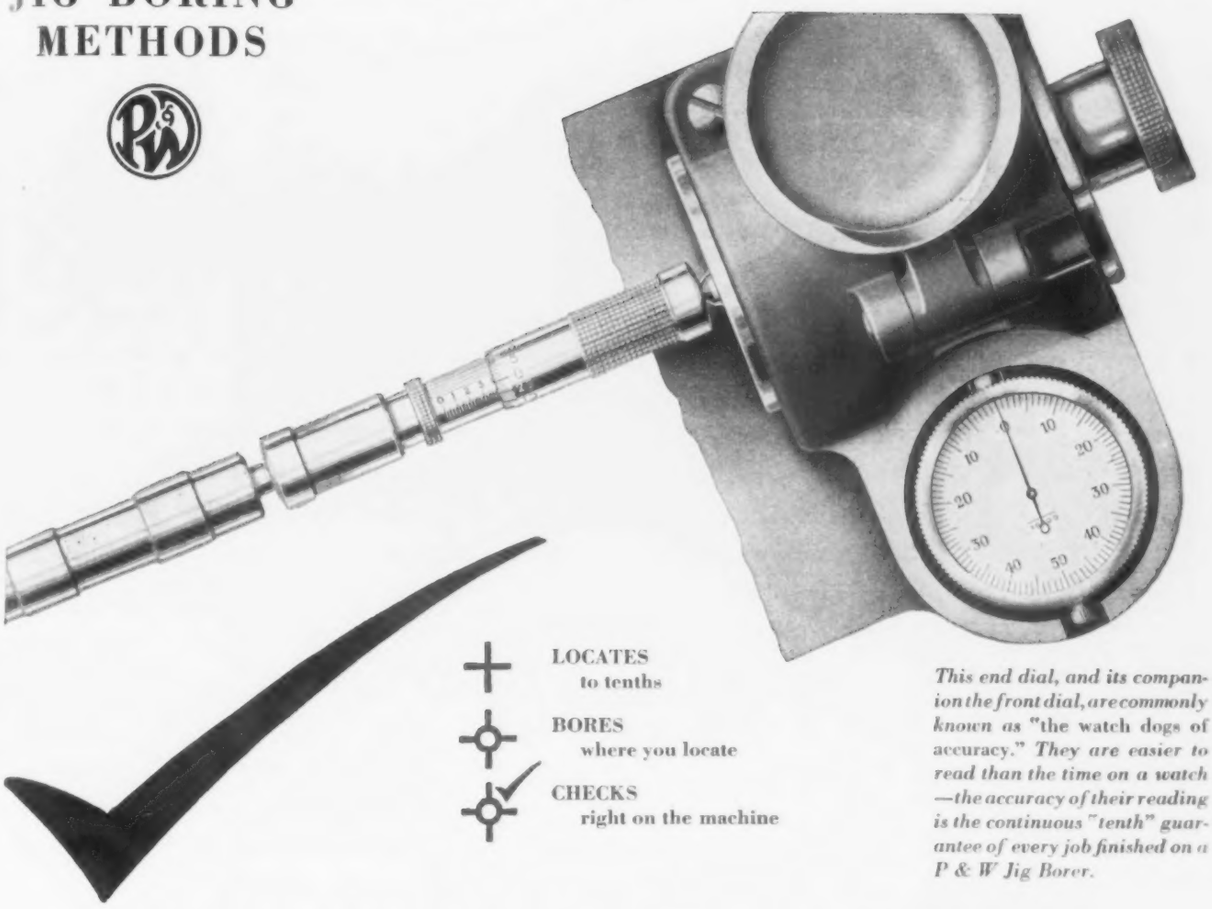
The Pratt & Whitney Jig Borer is a distinctly American achievement. Its precision—accurate to ten thousandths—is a necessity in shops working on mass production of parts which *must* be interchangeable.

For determining this accuracy, the simple, certain methods, known to every American apprentice, are used. They are not dependent upon a built-in part of the machine subject to wear or the strain of service. The P & W Jig Borer's perpetual accuracy is not affected by time or wear.

The continued installation of the P & W Jig Borer in hundreds of the finest American plants is proof that they consider it the finest precision boring machine in the world.

PRATT & WHITNEY CO.

AMERICAN JIG BORING METHODS



LOCATES
to tenths

BORES
where you locate

CHECKS
right on the machine

This end dial, and its companion the front dial, are commonly known as "the watch dogs of accuracy." They are easier to read than the time on a watch —the accuracy of their reading is the continuous "tenth" guarantee of every job finished on a P & W Jig Borer.

The P & W JIG BORER

What other precision borer gives visible accuracy at every moment while the work is being bored? Do you know any machine that can check its own work more accurately than the average inspector with a hand micrometer could?

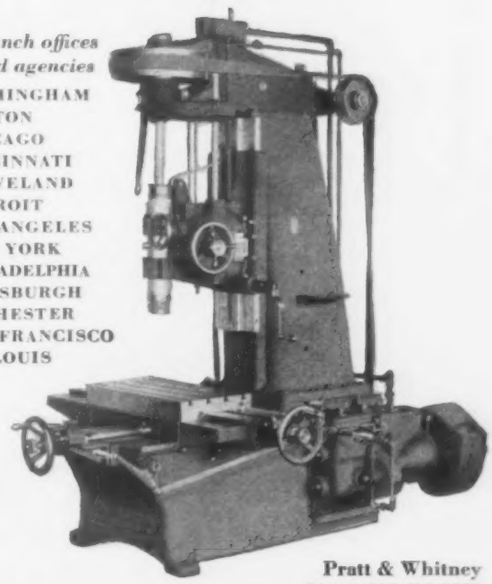
If you do much or little precision boring you should know the whole story of the Pratt & Whitney Jig Borer. It is a fascinating story of hours and dollars saved, and a finer, surer accuracy obtained. It has meant real profit to many who have read it.

Circulars that picture this machine, describe it and show its work are available if you will write for them. Or we will gladly send a sales engineer from our nearest branch office or agency to tell you of the P & W Jig Borer.

HARTFORD, CONN., U. S. A.

Branch offices and agencies

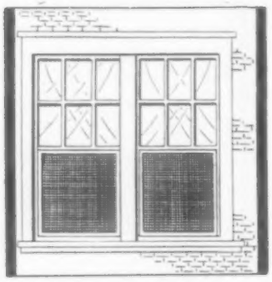
BIRMINGHAM
BOSTON
CHICAGO
CINCINNATI
CLEVELAND
DETROIT
LOS ANGELES
NEW YORK
PHILADELPHIA
PITTSBURGH
ROCHESTER
SAN FRANCISCO
ST. LOUIS



Pratt & Whitney
No. 2 JIG BORER

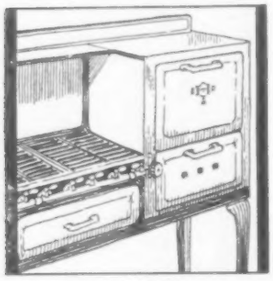
THERE'S AN OAKITE SERVICE MAN NEAR EVERY INDUSTRIAL PLANT

Use this NATION-WIDE *OAKITE cleaning service!*



CALIFORNIA

A MAKER of steel wire screens in California found it necessary to use a mixture of three different products for cleaning his wire preparatory to pickling before zinc plating. The mixture was difficult to handle, gave off injurious fumes when boiled in solution tank and rejects were frequent. To avoid these difficulties, the local Oakite Service Man was asked to make his recommendations. The tank was charged with one Oakite material which did the job satisfactorily. Costs are lower because considerably less material is required for charging the tank and for upkeep. And there are no fumes.



ILLINOIS

In one Illinois plant making gas stoves, it had formerly been necessary to soak parts for 20 to 30 minutes in a strong solution of cleaning material before the acid dip preceding vitreous enameling. Imperfect cleaning made necessary the refinishing of many parts. The Oakite method introduced by our local Service Man practically eliminated all rejects, and in addition not only shortened the cleaning time by half, but also reduced the amount of cleaning material needed by 40%.

OHIO

Peeling of the brass plate from the bevelled edges of door lock plates was causing one Ohio manufacturer of door locks and accessories a considerable loss. The trouble persisted despite scrubbing of the parts with water after a five minute dip in their former cleaning solution. To overcome this condition, a test with Oakite materials was arranged. Now a two minute dip in an Oakite solution brings plates out clean, ready for the plating bath. Scrubbing is eliminated and a first-class job is obtained.

Your local Oakite Service Man is equipped to give you practical help which should provide definite money-savings for you wherever cleaning, cutting and grinding, rust prevention or paint stripping operations are concerned. A post card will bring him to your plant, or send for further information on modern metal cleaning and modern cutting and grinding.

OAKITE PRODUCTS, INC., 20 Thames St., NEW YORK, N. Y.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the United States and Canada.

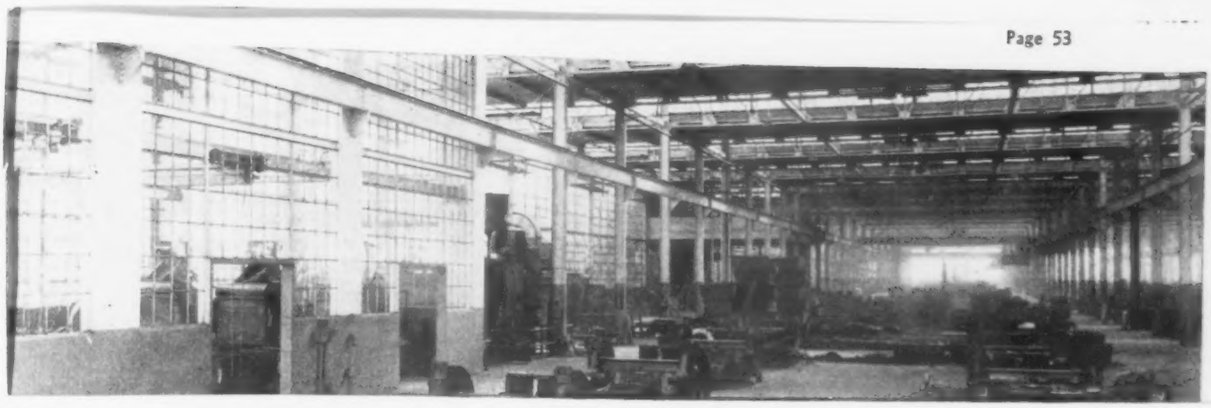
OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

This Advertisement is one of a series based on actual occurrences

THERE'S AN OAKITE MATERIAL FOR EVERY KIND OF CLEANING



How does a cat see . . . *in the dark?*

The probable optical principle by which a cat sees is a principle which helps to explain why human eyes see more sharply and clearly by Cooper Hewitt light.

All scientific observations of the cat so far made, tend to prove that it is totally color-blind. If this is so, it means that the cat's eye filters out all the rainbow colors of which "white" light is composed, except the particular color (or restricted group of spectral light rays) by which the cat sees. And that the cat sees quickly and sharply—even small objects in the dark—though not, of course, in complete absence of light—is common knowledge based on common observation.

Under Cooper Hewitt light, your eyes see more sharply and clearly because it is composed *almost wholly* of the cool yellow-green rays—a restricted group of spectral rays by which, science says, human eyes see best. The reason is this:

Your eyes cannot bring all the colors which make up "white" light to a focus on the retina. If focused for a color at one end of the spectrum, colors at the other end would be out of focus. So, the fewer the colors of which a light is made, the less will be the confusion of out-of-focus colors when light enters the eye and registers in images on the retina. Nearly of the same wavelength, the yellow-green rays of Cooper Hewitt light focus on the retina virtually as one.

For full information about Cooper Hewitt light write for booklet, "Why Cooper Hewitt Light is Better than Daylight." General Electric Vapor Lamp Company, Hoboken, N. J.

GENERAL ELECTRIC
VAPOR LAMP COMPANY

Science says the cool yellow and green rays of the spectrum are the rays by which we see best. The spectrum of Cooper Hewitt light is composed of over 90% yellow-green rays. This accounts for its remarkable seeing power and explains why workers in industrial plants, for which it is exclusively intended, say that Cooper Hewitt light is "Better than Daylight."

Blue and violet, which have comparatively little seeing power, comprise less than 10% of Cooper Hewitt light.

(See next page)

THERE'S AN OAKITE SERVICE MAN NEAR EVERY INDUSTRIAL PLAN

Use this NATION-WIDE OAKITE *cleaning service!*

Increasingly, manufacturers realize that the most convincing word for any product comes from the product itself. When that is so, they are eager to put that product into the prospective buyer's hands, without obligation to buy, and let it speak for itself.

♦

The General Electric Vapor Lamp Company has followed this policy with Cooper Hewitt light for years. And our knowledge, based on experience, that Cooper Hewitt light decreases spoilage, increases production and promotes factory efficiency generally, is invariably corroborated by a trial installation. A few Cooper Hewitt lamps, given a few weeks' try-out in an industrial plant, are followed almost always by a complete equipment of Cooper Hewitts. For the advantages of this soft, cool, glareless light are instantly obvious, creating a desire for similarly improved seeing conditions throughout a factory.

♣

Take one example: back in 1927 one important manufacturer of airplane and automotive parts put in four Cooper Hewitt lamps for a 30-day trial. After only a few days he realized their unusual advantages and ordered 62 more! By early 1928 he had built an addition to his factory and installed 98 more Cooper Hewitts! Then followed, later in the same year, an order for 230 additional lamps! Today there are 394 Cooper Hewitt mercury-vapor lamps in this factory, making vision sharp and clear for every worker and inspector.

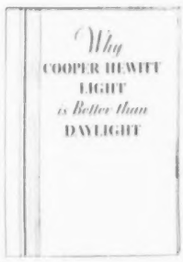
♠

And this factory, mind you, is of the modern, monitor-type roof design. But Cooper Hewitt light is needed to improve the available daylight and to give "better than daylight" illumination 24 hours a day. Cooper Hewitt light is composed almost wholly of the best-seeing light rays known to science and therefore augments and blends perfectly with daylight.

♥

BETTER THAN DAYLIGHT

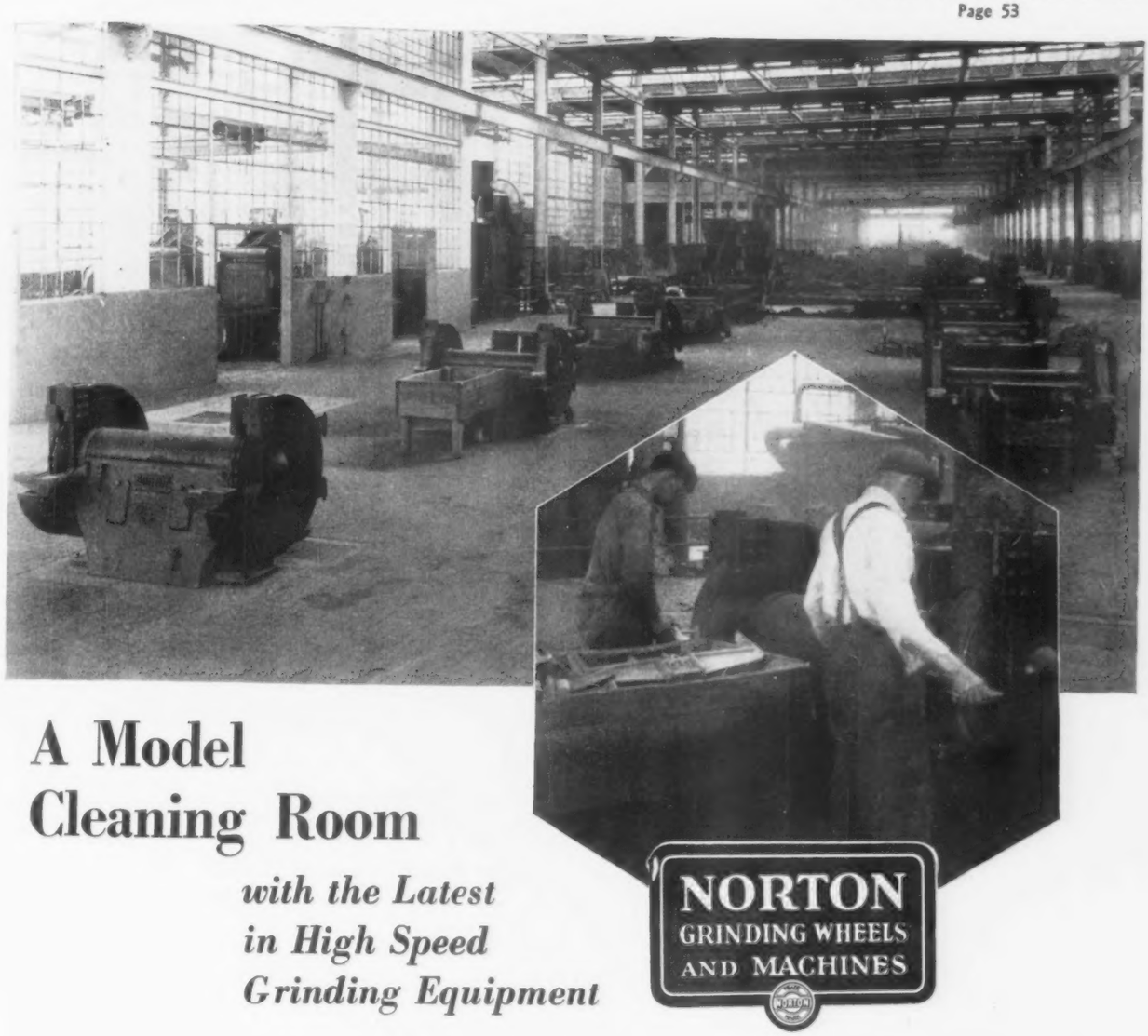
MANY other advantages of Cooper Hewitt illumination are given in a simply written booklet "Why Cooper Hewitt light is better than daylight" which will be sent gladly upon request. General Electric Vapor Lamp Co., 833 Adams Street, Hoboken, N. J.



GENERAL ELECTRIC
VAPOR LAMP COMPANY

(Formerly Cooper Hewitt Electric Company)

417 G. E. V. L. CO., 1930



A Model Cleaning Room

with the Latest in High Speed Grinding Equipment

NORTON
GRINDING WHEELS
AND MACHINES

A BATTERY of eight Norton 36″ High Speed Floor Stands with Norton Unicast Wheels snagging grey iron castings in the modern foundry of a manufacturer of textile machinery.

Made up of vitrified segments, the Unicast wheel possesses the advantages of the open structure of the vitrified process but with an operating speed of 9000 s.f.p.m. instead of the normal vitrified wheel speed of 6000 s.f.p.m.

The Norton High Speed Floor Stand is a heavy duty, vibrationless machine which is capable of giving long, satisfactory service under the most exacting foundry conditions. Where large amounts of material have to be removed quickly, 36″ diameter wheels have a decided productive advantage over smaller diameter wheels.

Let this combination — Norton High Speed Machines and Wheels — reduce *your* cleaning room costs. Complete information upon request.

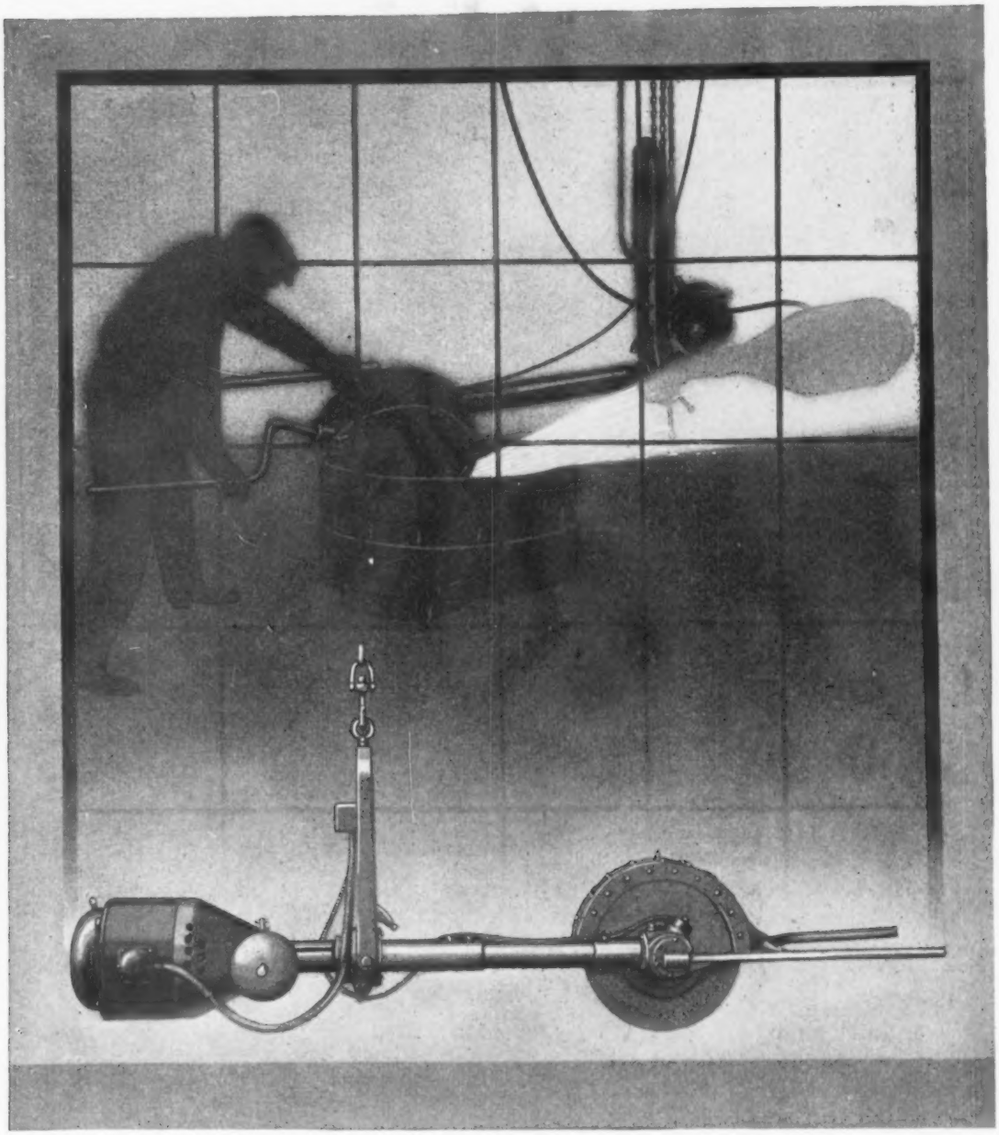
NORTON COMPANY
WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh Hartford
Cleveland Syracuse Hamilton, Ont. London Paris
Wesseling, Germany

W-351

NORTON PRODUCTS — Grinding Machines; Lapping Machines ~ Grinding Wheels; Abrasives for Polishing; Pulpstones; India Oilstones ~ Refractories; Porous Plates ~ Norton Floors—Alundum Tiles and Aggregates

PROGRESSIVE GRINDING



A direct motor driven swing frame grinder pronounced by its many enthusiastic users as "A REAL GRINDER". Constructed of the best materials available with totally enclosed motor and bearings.

DIRECT MOTOR DRIVE - - NO BELTS

The Standard for 16", 18" and 20" diameter Vitrified wheels. The High Speed for 18", 20" and 24" diameter Bakelite wheels.

You will be interested in the prices and specifications — We invite your inquiries.

THE STERLING GRINDING WHEEL CO.
Abrasive Division of The Cleveland Quarries Co.
Factory and Office: TIFFIN, OHIO
CHICAGO: 23 So. Jefferson St. DETROIT: 5191 Lorraine Ave.

STERLING ABRASIVES
AND STERLING GRINDING MACHINES

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

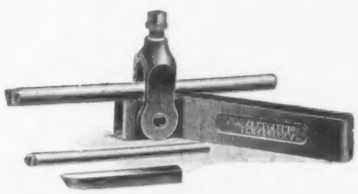
"We use Armstrong Tools wherever possible . . . . . "

—*H. W. VOSS, Secretary, Monighan Manufacturing Co., Chicago*

"We are pleased to advise that in our shop we use ARMSTRONG Tools wherever possible and consider them the best we are able to procure. We use ARMSTRONG Tool Holders, Lathe Dogs, and Wrenches of all kinds."

There is a built-in quality, an excellence of design, material and workmanship that characterizes ARMSTRONG products. It has always been a policy of this company to make no "seconds" or inferior grades of tools. All of the resources, the selection of all equipment, and the training of all workmen are directed to one end, the manufacture of highest quality tools. Each ARMSTRONG product is rigidly inspected, must qualify as an ARMSTRONG Tool or be destroyed. You can always depend on the ARMSTRONG name when accompanied by the Arm-and-Hammer Trade Mark. It is a certain guarantee of complete satisfaction.

ARMSTRONG



This light Boring Tool Holder can, because of its reversible, off-set head, be used as either a right-hand or left-hand tool. Takes a light boring bar or standard bit.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
309 N. Francisco Ave., CHICAGO, U. S. A.

ARMSTRONG

Tool Holders
Lathe Dogs
"C" Clamps
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Chain Pipe Wrenches
Pipe Wrenches

ARMSTRONG BROS.

Solid Dies and Stocks
Adjustable Dies and Stocks
Ratchet Stocks
Triplex Stocks
Pipe Cutters
Chain Vises
Hinged Pipe Vises
Knife Blade Cutter Wheels

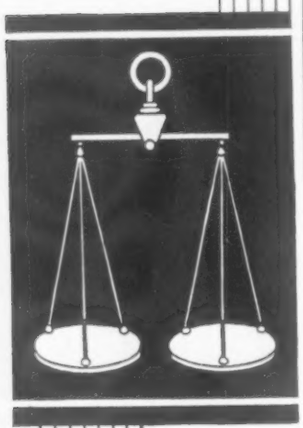
Buy ARMSTRONG TOOLS from your Supply House

WRITE for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools.

ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

BALANCE



CARBORUNDUM practice dictates that BALANCE should be "Born" in a Grinding Wheel

REG. U. S. PAT. OFF.

BALANCE should be born in a grinding wheel—born of a uniformity, a "balance" in the actual wheel mass—a homogeneity of the grain and bond, plus accurate dimensional sizing and the proper finishing of the wheel.

Carborundum practice is aimed towards building a balance into grinding wheels right from the very start—not by way of corrective measures after they come from the kilns.

And during the past five years Carborundum research has made important strides towards the producing of wheels nearer to perfect balance than ever before in the history of the industry.

Tolerances or compensations have been drawn closer and closer until today we are making a remarkably high percentage of both snagging and precision wheels *that require absolutely no correction for balance.*

Balance is born in these wheels.

The result is the building of grinding wheels that are so close to perfect balance—that have such refinements of balance—that wheel life is greatly prolonged.

Excessive vibration and undue strain on bearings and spindles are either eliminated or greatly reduced. More accurate work and better finishes, where these factors are essential are made possible.

This question of wheel balance is an all important one and the results of Carborundum research towards the production of wheels that require little or no corrective measures has been far-reaching indeed.

It has been an important Carborundum contribution to industry.

And it is such constant research and vigilance that is enabling Carborundum-made Grinding Wheels to make and maintain performance records for production—for finish—for grinding economies.

THE CARBORUNDUM COMPANY, Niagara Falls, N. Y.

CANADIAN CARBORUNDUM CO., LTD., NIAGARA FALLS, ONT.

Sales Offices and Warehouses in

New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids, Toronto, Ont.

The Carborundum Co., Ltd., Manchester, England — Deutsche Carborundum Werke, Reisholz bei Dusseldorf, Germany

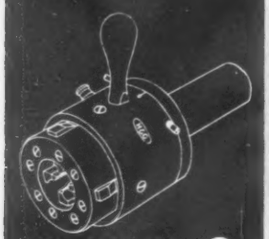
(CARBORUNDUM IS A REGISTERED TRADE MARK OF THE CARBORUNDUM COMPANY)

STYLES and sizes

for all machines on which threads are cut. All styles of H & G Die Heads of a given size take the same chasers, thus simplifying chaser stock.

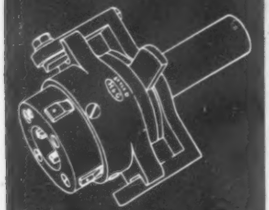
STYLE EE

(Rotary)
Designed for automatics, threading machines and bolt cutters, where the die head rotates.



STYLE C

Hand closing Die Heads for hand turret machines.



STYLE D

Head for Brown & Sharp Automatics and other small machines.

IT TAKES GUTS TO MAKE A CHAMPION

WRESTLING is no sport for weaklings . . . punishment is terrific and long drawn out . . . strength and skill are vital, but not enough to make a champion . . . unless backed by that supersomething that men call "GUTS."

The proven endurance, greater speed, greater accuracy, and thorough dependability of H & G Die Heads, has established them as the champions of their field.

H & G chasers are made from finest high speed steel. Hobs are ground in the thread *after* hardening. New heat treating equipment adds that degree of hardness and toughness which makes for long life. The H & G method of finishing *after hardening* gives complete control of clearance and lead and straightness.

To cut down your threading costs, use H & G Die Heads.

We'll be glad to send you an H & G Die Head for 30-day trial.

THE EASTERN MACHINE SCREW CORP.
Truman and Barclay Sts.
New Haven Conn.
Write for Literature.

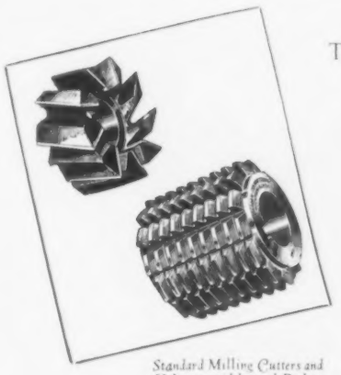
H&G

DIE HEADS

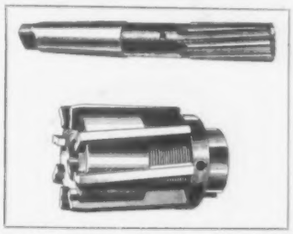
Write for description of H & G Feed Pushers for better stock feeding on Automatic Screw Machines

BARBER-COLMAN PRODUCTS

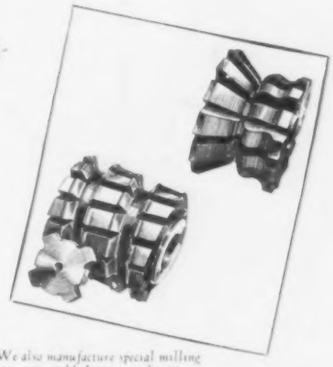
The illustrations on this page reflect the scope of BARBER-COLMAN service to American manufacturers



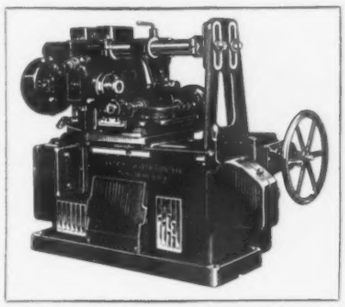
Standard Milling Cutters and Hobs are widely used Barber-Colman Products



Standard and Special Type Reamers of both fluted and inserted tooth types, are important items in the Barber-Colman line

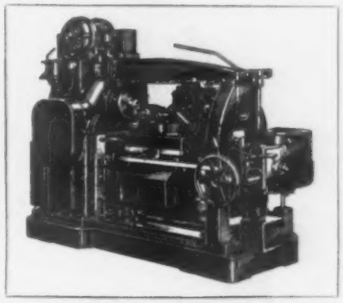


We also manufacture special milling cutters and hobs to meet the most exacting requirements

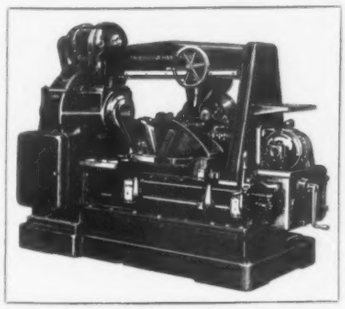


This is the No. 12 Barber-Colman Hobbing Machine for generating spur and helical forms

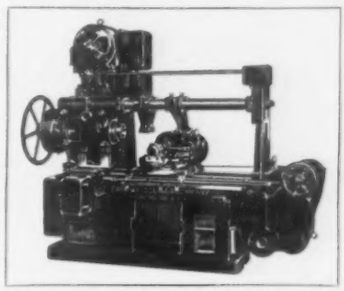
Since 1908, when the Machine and Small Tool Divisions of Barber-Colman Company were established, this company has maintained a forward-looking policy in the development of all of the products it has manufactured for American industry, whether these be its Hobs, its Hobbing Machines, its Reamers and Milling Cutters, or its Hob Sharpening or Reamer Sharpening Machines. Sound engineering, correct design, the finest of materials, and the best possible workmanship are incorporated into these Barber-Colman Products, with the addition of that intangible something which has prompted us to set quality and precision standards always a trifle ahead of today's best possible attainments. This, we think, is more than merely keeping abreast of the times. Rather it is a spirit of keeping always ahead of tomorrow's demands . . . And this policy, and this only, can spell progress.



This Type B Hobbing Machine handles arbor loads up to 12"x12" in size. For spur forms only



Here is the Barber-Colman No. 17 Hobbing Machine, which is a limited-purpose machine for spur forms

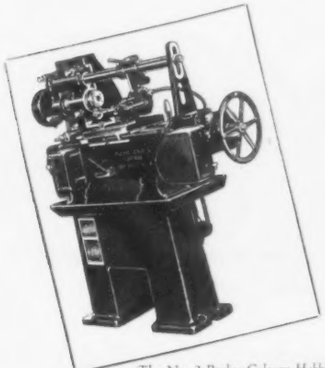


And here is a special No. 12 Hobbing Machine—used for production hobbing of spline shafts.

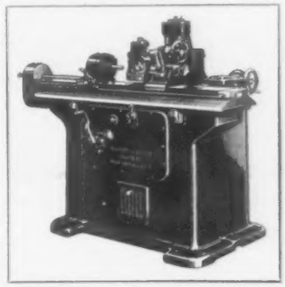
BARBER-COLMAN COMPANY

General Offices and Plant

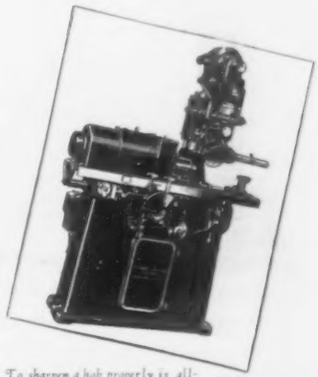
ROCKFORD, ILL., U. S. A.



The No. 3 Barber-Colman Hobbing Machine for spur and helical forms, is widely used in industry



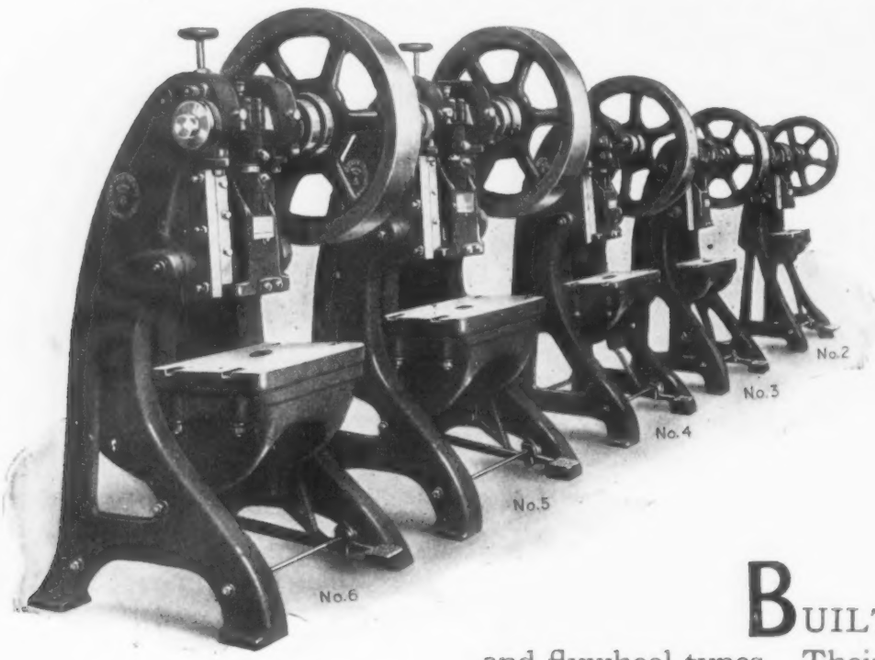
An important development in the Reamer field is the Barber-Colman Reamer Sharpening Machine



To sharpen a hob properly is all-important. It's best done with a Barber-Colman Hob Sharpening Machine

"ADRIANCE"

INCLINABLE OPEN BACK POWER PRESSES WITH FRONT ADJUSTMENT



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WESTERN MACHINERY EXCHANGE
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We manufacture:

Inclinable Presses
Straight Side Presses
Square Double Seamers
Round Double Seamers
Automatic Feed Presses
Horning and Wiring Presses
Double Action Presses
Double Crank Presses
Drawing Presses
Automatic Screw Rolling Machines
Punching Presses
Arch Type Presses
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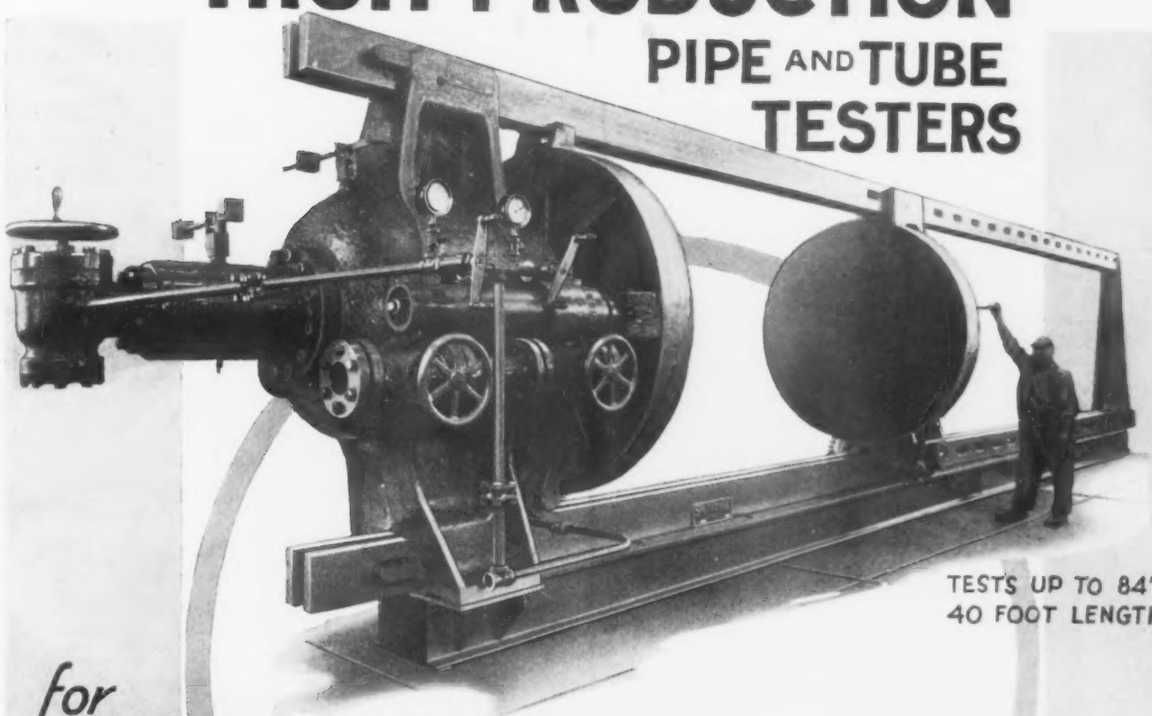
Spinning Lathes
Power Squeezers
Crown Cap Making Equipment
Dies and Tools
for Working Sheet Metal

BUILT in five sizes in geared and flywheel types. Their flexibility of operation with dies upon sheet-metal has commended them to the trade as the most practical of all-purpose power presses. "Adriance" Automatic Feeds may be attached to these presses, making complete automatic units for the increased efficiency required in modern mass production.

ADRIANCE MACHINE WORKS, INCORPORATED
82 RICHARDS STREET BROOKLYN, N. Y.

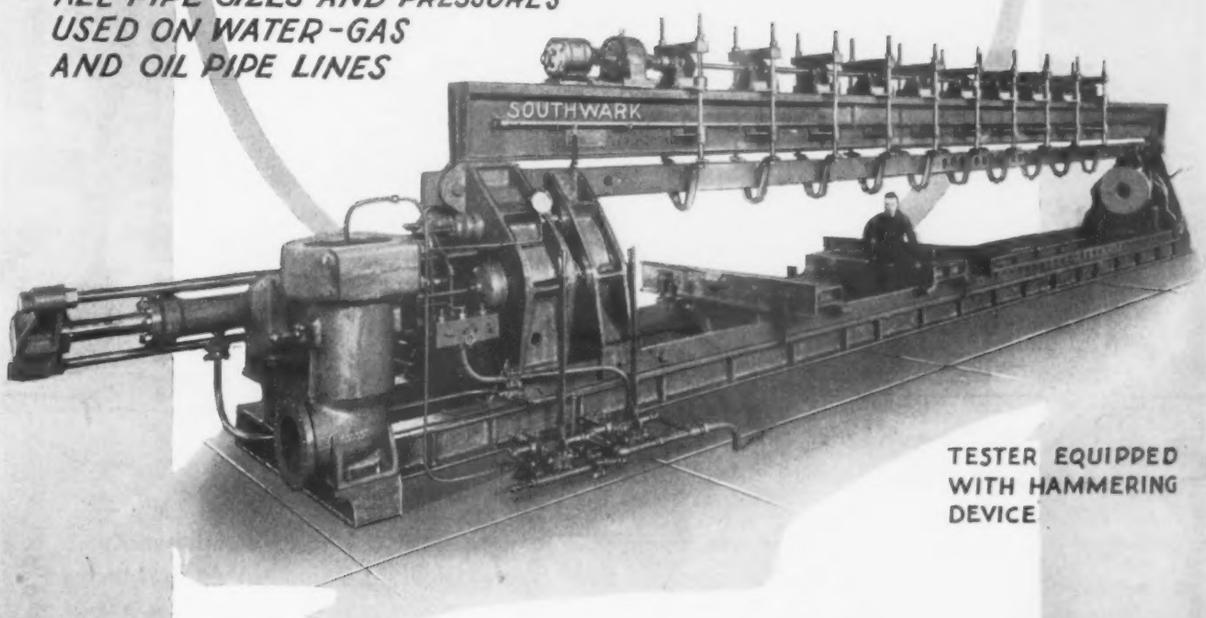
☐ Please send copy of Bulletin No. 1, illustrating and describing "Adriance" Inclinable Open Back Power Presses
☐ Please send information regarding.....
Name .....
Address .....

HIGH PRODUCTION
PIPE AND TUBE TESTERS



TESTS UP TO 84" DIA.
40 FOOT LENGTHS

for
ALL PIPE SIZES AND PRESSURES
USED ON WATER-GAS
AND OIL PIPE LINES



TESTER EQUIPPED
WITH HAMMERING
DEVICE

BALDWIN-SOUTHWARK CORPORATION
SOUTHWARK FOUNDRY & MACHINE CO. DIV.
PHILADELPHIA

AKRON **SOUTHWARK** CHICAGO

SCRAP METAL BALERS

POWERFUL, simple, speedy, economical — Galland-Henning presses lead wherever scrap is handled. From the smallest hand paper baler to the world's largest steel compresses Galland-Henning workmanship assures greater scrap profits.

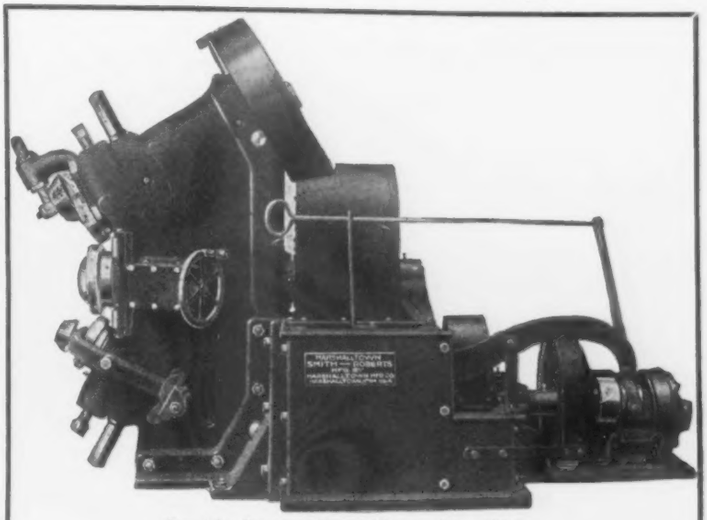
Model 62-MC, shown, handles the toughest bulky scrap quickly and neatly — a surge of power gathers the charge — a ram at right angles completes the bale at a rate of 8 tons of metal an hour. Other metal presses with capacities as low as 2½ tons a day for the smaller Shop . . . Unrestricted charging areas. Deep box eliminates costly cutting, tamping and stacking. Reduce time and labor costs and add to profits . . . Write us for the story of Baling at a Profit.

GALLAND-HENNING MANUFACTURING COMPANY

2743 So. 31st Street Milwaukee, Wis. Offices in Principal Cities

THE MARSHALLTOWN LINE

You Save Time, Labor and Money



Double Rotary Bevel Shear No. 234

Throatless Shear No. 112

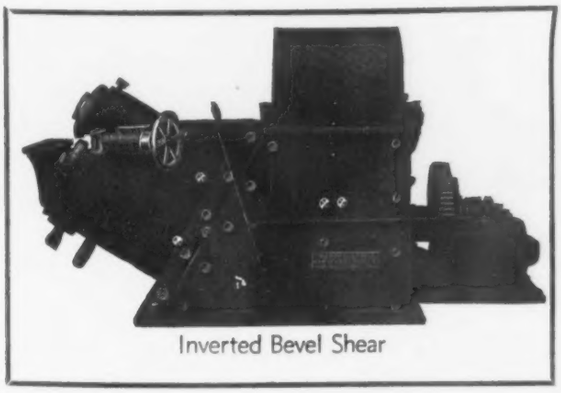
with

MARSHALLTOWN THROATLESS SHEARS

Marshalltown Throatless Shears lower costs wherever they are installed. The throatless feature permits faster cutting of sheets and plates, regardless of size.

Cut curves of small radii in any direction . . . slit plates or sheets of half-inch and under, without buckling or stretching of material. The work is finished when it leaves the machine.

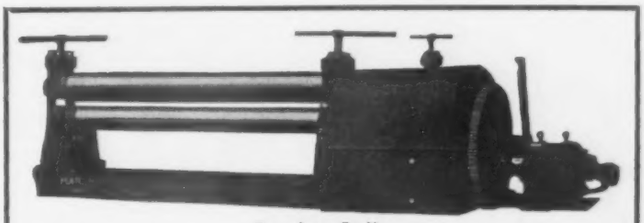
Self-feeding and easy to operate. If you want to produce higher quality work at lower cost, use Marshalltown equipment.



Inverted Bevel Shear

MARSHALLTOWN MANUFACTURING CO.

MARSHALLTOWN, IOWA.



Bending Rolls

Federal

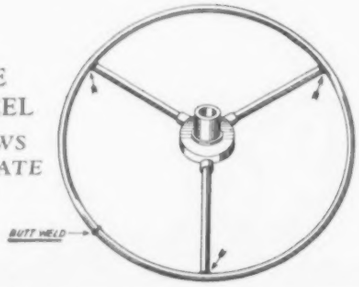
Announcing Our Latest Contribution to Fabricators of Metal Products

by Electrical Resistance Welding . . . "The World's Best Assembly Method"

Above—3 Spokes Welded to the Rim Simultaneously. Producing 300 Wheels per Hour.

AUTOMOBILE STEERING WHEEL

ARROWS INDICATE WELD



The finished product above shows that automotive travel depends upon the reliability of welds.

Consult our engineers on your welding problems.

THE Federal

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Your Welding and Cutting Equipment always active

—profitably!

There is always a production or maintenance problem in almost any plant that could be solved more economically.

If either your production or maintenance is concerned with metal, oxy-acetylene welding or cutting can usually make a real saving for you.

If you have oxyacetylene equipment, is it being used to full advantage? Aren't there operations in your production where the oxyacetylene torch would be a more satisfactory solution at less cost? What about worn or broken machine parts that could be reclaimed at small expense?

If you haven't oxyacetylene apparatus, there are pretty sure to be places where you could use it to advantage.

In either case it would be worthwhile to write or telephone your nearest Airco Office listed, tell us what your business is, and ask for suggestions that would apply to it. No obligation of course.

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Airco Oxygen—Airco Acetylene—Airco-Davis-Bournonville Welding & Cutting Apparatus—Supplies—National Carbide

True economy in welding

Once the initial cost of the welding machine has been written off, the principal cost items of a welding job are labor and welding wire.

In most cases, the cost of the welding wire is insignificant compared with the cost of labor. Yet the strength and dependability of the welds largely hinge on the quality of the deposited metal.

Since welding wire plays such an important part in the production of good welds—but represents a very small part of total welding cost—is there real economy in using anything but the best welding wire, particularly when the best costs so little more?

Thousands of plants and utilities—including the country's foremost manufacturers and railroads—attest to the economy and superiority of Roebling Welding Wire. We invite you to test it and we'll gladly furnish samples. Made in various analyses, in both gas and electric types.

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J.
Wire · Wire Rope · Flat Wire · Copper and Insulated Wires and Cables
New York Chicago Philadelphia Atlanta Cleveland
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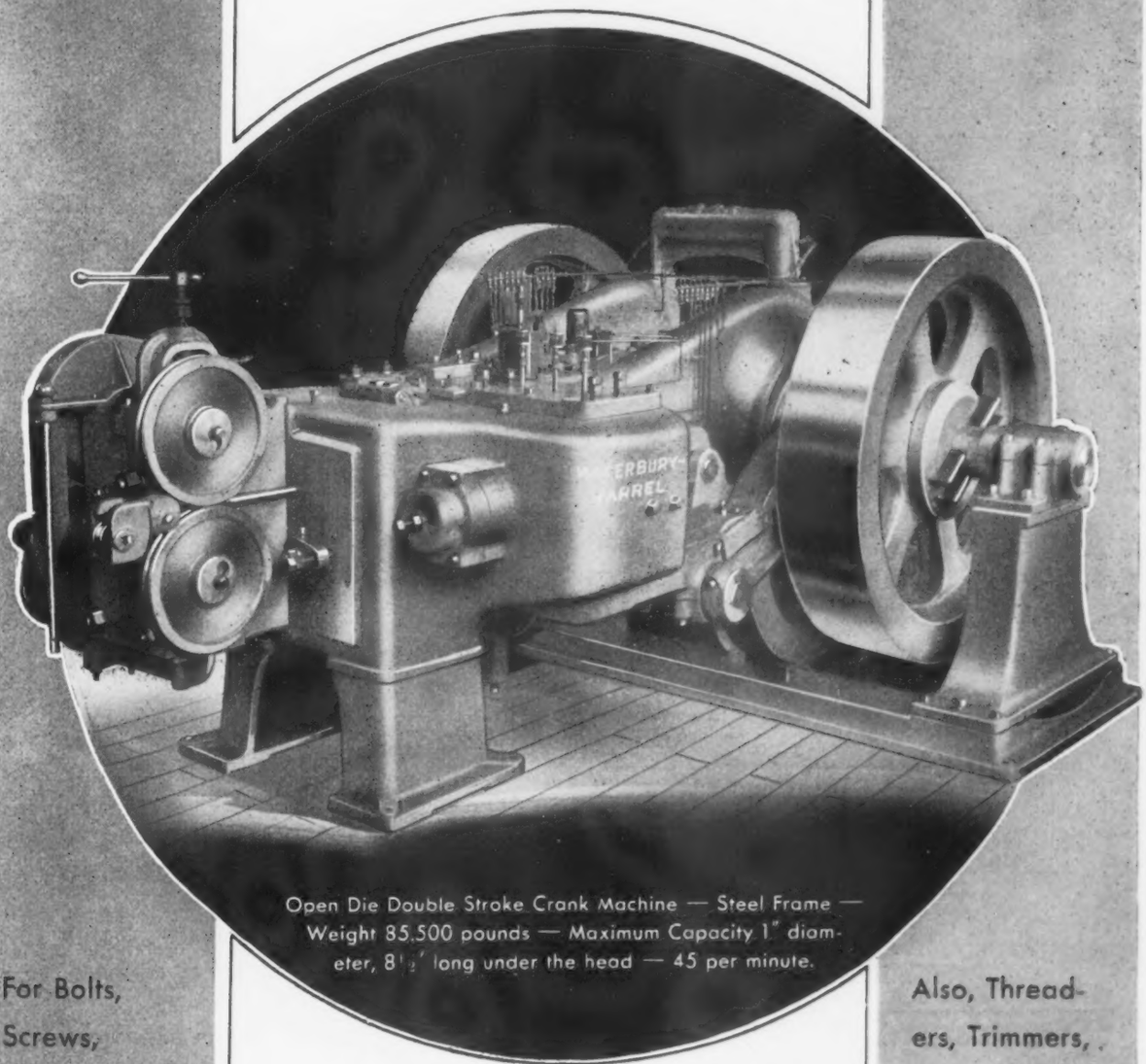
ROEBLING WELDING WIRE

WATERBURY-FARREL
Headers

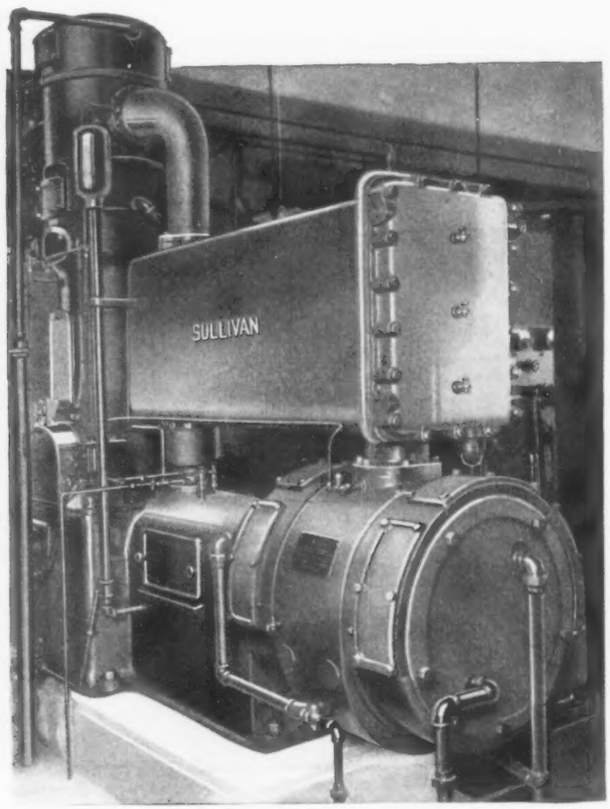


Open Die Double Stroke Crank Machine — Steel Frame — Weight 85,500 pounds — Maximum Capacity 1" diameter, 8½" long under the head — 45 per minute.

For Bolts, Screws, Rivets, Rods, Spokes and other headed work made by the cold process.

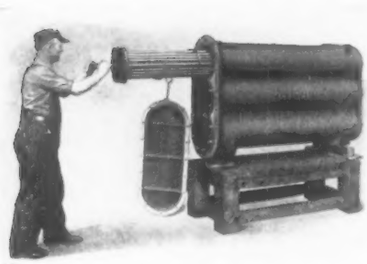
Also, Threaders, Trimmers, Slotters, Nut Machines, Rod, Wire, Tube & Sheet Metal Machinery, Presses, etc.

THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY
WATERBURY, CONNECTICUT, U.S.A.



One of the Sullivan Balanced Angle Compressors at work for builders of Television equipment.

Big Business gets behind *Television* to tempt a willing public



The intercooler of the Balanced Angle Compressor illustrates the detailed care with which Sullivan compressors are built. Its three nests of water tubes are made of copper to give maximum removal of heat. The nests may be removed for cleaning by merely removing a few bolts.

Television at a popular price is awaited by millions of eager buyers.

Profits depend not only on refinement of the product—but on low manufacturing costs.

—and the leaders behind Television use air power by Balanced Angle Compressors.

The economies of these compressors are obvious to those who investigate. Power consumption is almost ideal, at any load, due to smooth operation and multi-step control.

Floor space is conserved and compressor wear is minimized.

For details get Booklet 83-W

With Production the Key to profits, leaders adopt

SULLIVAN COMPRESSORS

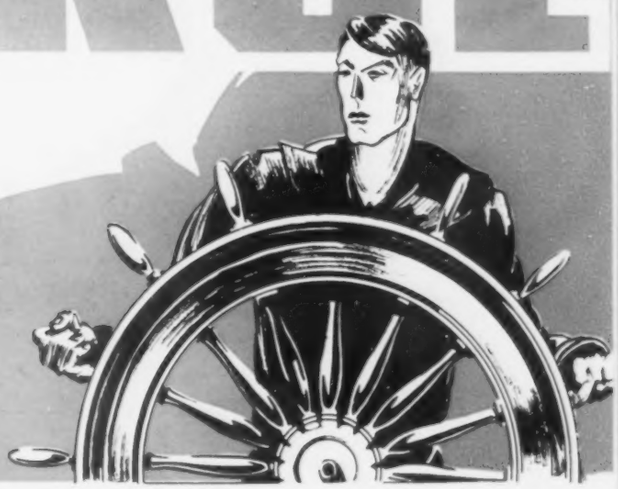
60 TO 6000 CUBIC FEET A MINUTE

SULLIVAN MACHINERY COMPANY
821 Wrigley Bldg., Chicago
30 Church St., New York

[CONTROL

HYDRO • POWER

TRADE MARK REG. U. S. PATENT OFFICE



H-P-M

HYDRO-POWER CONTROLS *the* DESTINIES *of* PRODUCTION

LIKE the mariner who "wheels" his craft over a definitely charted course to safety . . . so, Hydro-Power, with its positive control, shoulders a tremendous responsibility in safeguarding the production of Modern Industry. Regardless of the job—the guiding principles of predetermined pressure assures the safety and quality of the work at hand. With Hydro-Power, a new conception of press performance is experienced. The shock of sharp impact is discarded entirely—giving way to the H-P-M "Fastraverse" system that causes quick and accurate die contact before actual pressure is applied. Then a powerful squeeze controlled to the exact pressing limits is applied, eliminating all of the disadvantages of less effective methods. There is an H-P-M Press to solve your most intricate pressing problem. Write for Bulletin 30-A-1.

THE HYDRAULIC PRESS MANUFACTURING CO.

HOME OFFICE AND FACTORY: MOUNT GILEAD, OHIO
EASTERN OFFICE: 220 BROADWAY, NEW YORK CITY
Representatives in Principal Cities

Copyright 1931
THE H. P. M. CO.

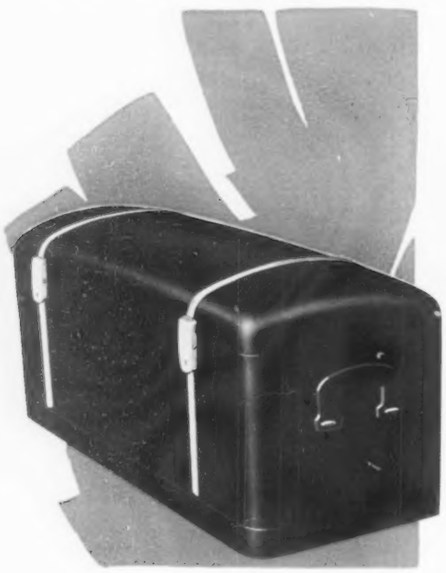
Capacities from 150-250 tons to 2,000 tons. Square bed type Bolster sizes; from 24″x24″ to 84″x84″; open side bed type; from 60″x36″ to 216″x72″—US Patent Numbers 1,653,350, 1,672,651, 1,711,378, 1,746,419—other patents pending. HYDRO-POWER Trade Mark registered.

H-P-M HYDRO POWER IN ACTIVE SERVICE

Copyright 1931
THE H. P. M. CO.

One H-P-M Press Performs 23 Major Operations on Auto Trunk

for world's largest manufacturer » »



THIS is the record of Hydro-Power achievement for the largest manufacturers of metal auto-trunks. 23 operations on a single trunk, each requiring an individual tool set-up to conform to the operation in question. The versatility of the H-P-M Hydro-Power Press is described in the work that is handled. One of the most outstanding jobs is the cover that calls for twenty gauge extra deep draw body stock being drawn to a depth of 5½" over a width of from 14" to 18" and a length of from 32" to 39". Complete control over metal is assured through the H-P-M die-cushioning feature that reduces scrappage to a minimum. Other operations include blanking, stamping, forming, and piercing.

Where versatility and controlled high pressure are factors, H-P-M Hydro-Power presses are leading the way.

THE HYDRAULIC PRESS MANUFACTURING CO.

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HYDRO-POWER

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ENGINEERING ...First Requisite of a Good Oven

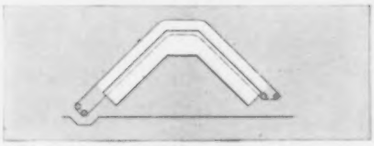
THE engineering files of the experienced oven builder contain hundreds of variations on basic industrial oven types, each offering a special solution to some definite production requirement and applicable when that particular requirement occurs.

The skillful use of these variations and a wide experience in the behavior of oven treated products are the essentials of oven engineering. This is often the only discernible difference between the installation which produces mediocre work at a high operating cost and that which produces excellent work at a much lower operating cost.

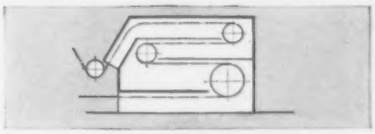
If you would keep your production costs within the range of present day markets, make sure that your equipment does not penalize your efforts. When that equipment is an oven, avail yourself of the experience of engineers who are constantly reducing oven operating costs for work of just the type you are doing. There is no obligation in a conference with Young Brothers engineers and their suggestions may point to worth-while savings.

Intermittent Conveyor

Tunnel Type

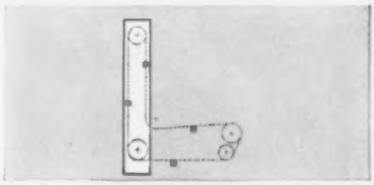


"A" Type

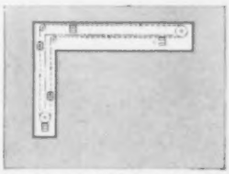


Multi-Pass

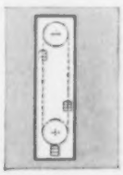
Hump



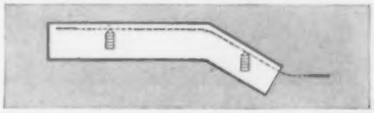
Vertical



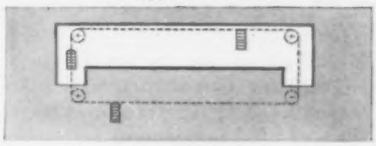
"L" Type.



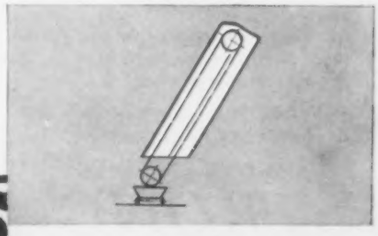
Tower



"U" Type Horizontal



Horizontal



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90 State St.....Albany, N. Y.

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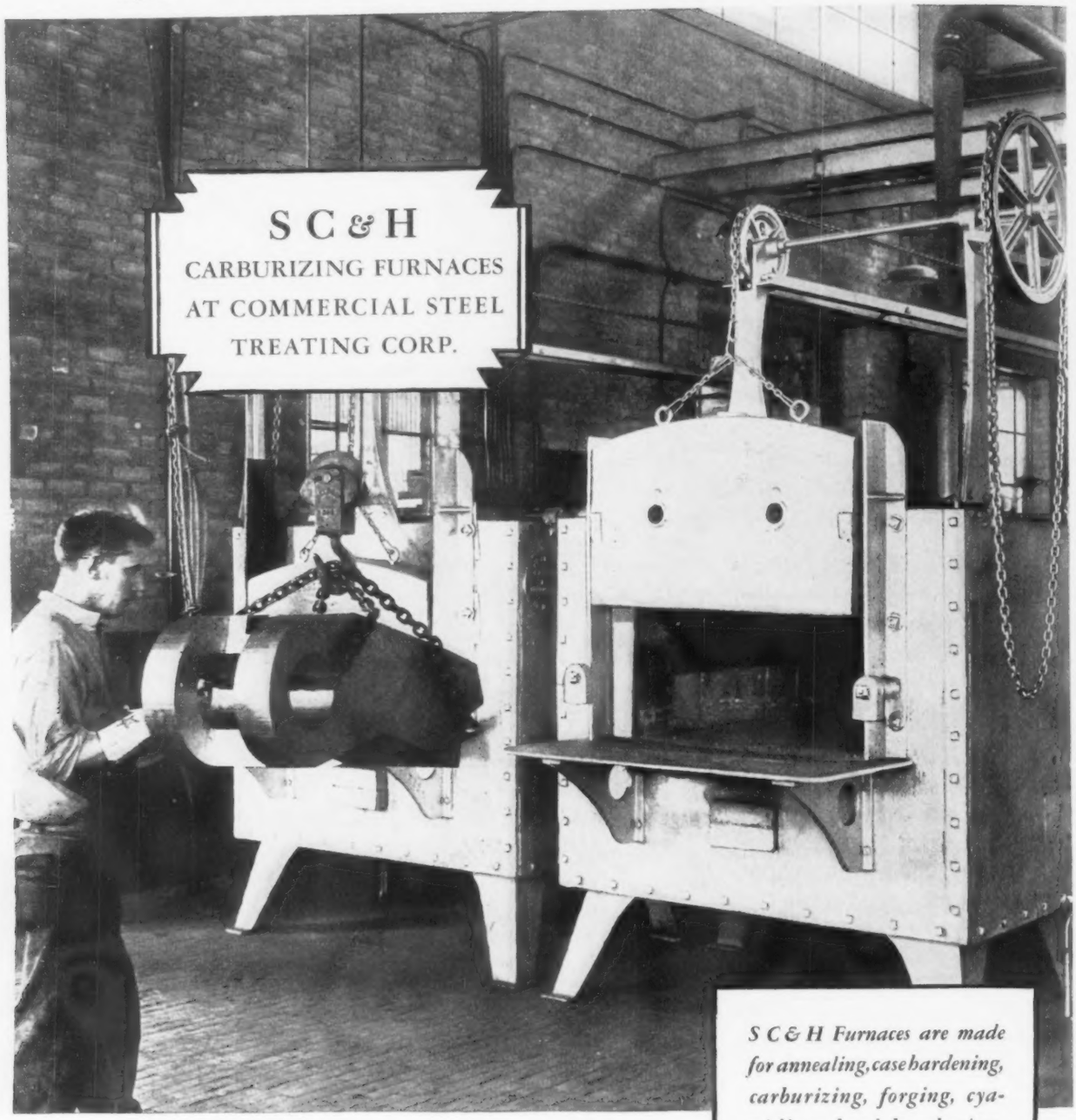
6504 Mack Avenue . . . Detroit, Michigan

OVENS FOR Core and Mold baking . . . Low temperature heat treating . . . Drying . . . Japanning and enameling . . . Electrical appliance baking . . . Adapted to all methods of heating.

YOUNG BROS. CO. OVENS — OUR BOLTLESS JOINT — DETROIT

INDUSTRIAL OVENS



A COMMERCIAL heat treating plant requires dependable furnace equipment—and here in Detroit at the Commercial Steel Treating Corporation there are two S C & H oil-fired box type furnaces used for general carburizing.

Both are automatically controlled and operate at 1650°-1700° Fahr. in this service. Material ranging in size from very small parts to huge toggle-links as shown are heat treated in them.

When you call in *Strong, Carlisle & Hammond* Engineers you can be certain that any furnace they build will incorporate the most modern improvements known to furnace construction. Whether it is a lead pot or salt bath, a furnace for the tool room or one for annealing rolling mill sheets, an SC&H name plate on it means that it was built for your specific job to deliver its full capacity year in and year out. Ask our engineers to estimate on your requirements. The Strong, Carlisle & Hammond Company, 1382 W. Third St., Cleveland, Ohio.

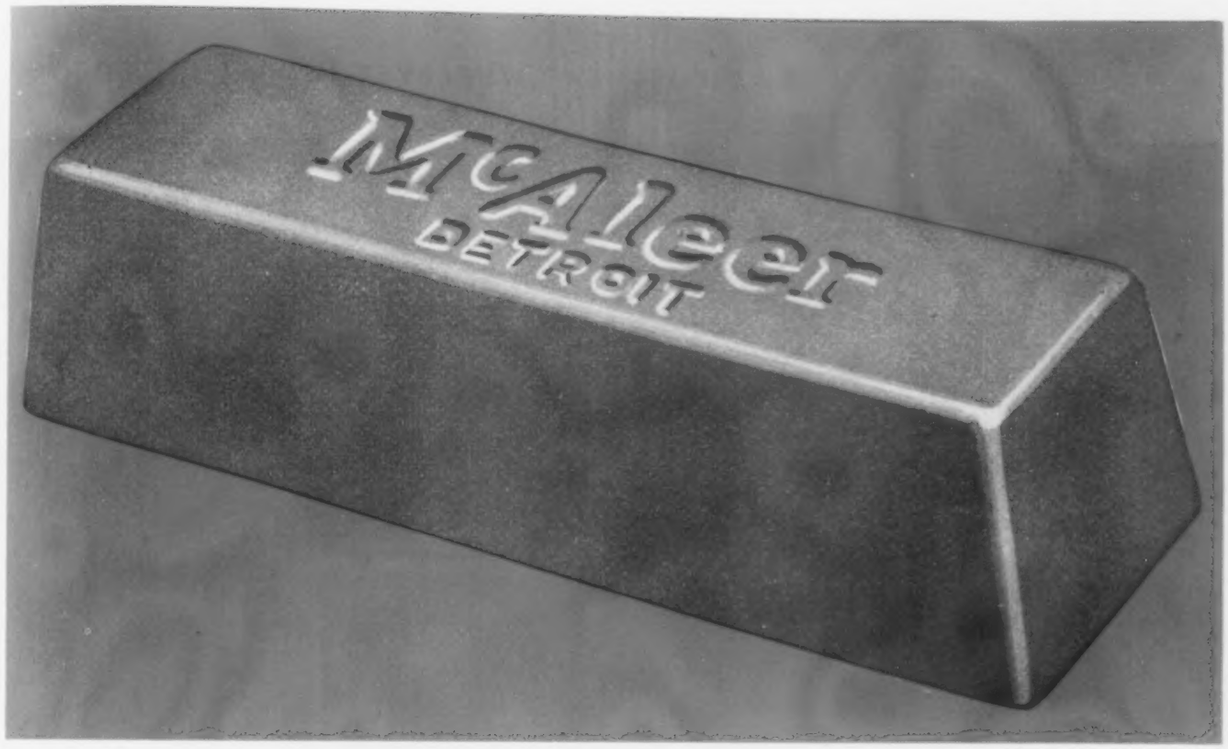
S C & H Furnaces are made for annealing, case hardening, carburizing, forging, cyaniding, lead hardening, nitriding and oil tempering. They are built in all sizes of Oven, Pot, Continuous, and Special Types for Electric, Oil or Gas application.

DISTRICT OFFICES:

136 FEDERAL STREET - - - BOSTON, MASS.
2832 EAST GRAND BLVD. - - DETROIT, MICH.
11 S. DESPLAINES STREET - - CHICAGO, ILL.
335 FIFTH AVE. - - - PITTSBURGH, PA.
30 CHURCH STREET - - - NEW YORK, N.Y.

STRONG, CARLISLE & HAMMOND

MANUFACTURERS OF ELECTRIC, OIL AND GAS INDUSTRIAL FURNACES



. . . ideal for factory buffing of STAINLESS STEEL PRODUCTS

Products made of Stainless Steel:

Automobile lamps, radiator shells, bumper plates, hub caps, gas tanks, cowl strips, window mouldings, running board mouldings, tire covers, windshield frames and brackets, instrument boards, horns, etc. . . . airplane parts . . . restaurant equipment . . . railings . . . kitchenware . . . lighting fixtures . . . razors . . . electric irons . . . household hardware . . . cutlery . . . grills . . . doors and door frames . . . refrigerator hardware . . . cigar lighters . . . ash trays . . . window sash and frames . . . building entrances and domes, etc.

Next to the actual delivery, the final step in the completion of a stainless steel contract is the satisfactory finishing or buffing of the product . . . and for this purpose manufacturers everywhere are using McAleer's Stainless Steel Buffing Compositions.

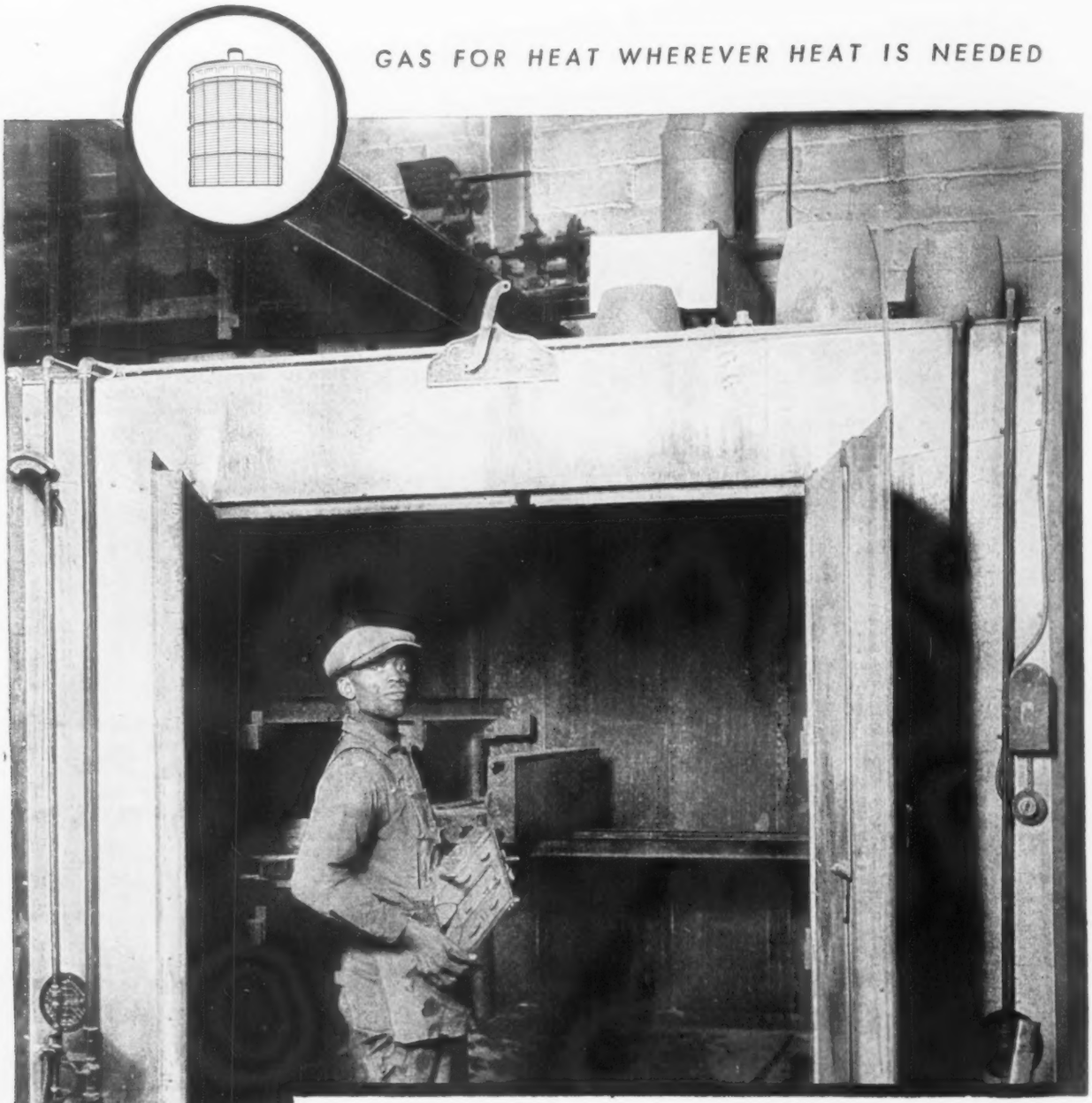
First to develop an efficient, quick and economical means of giving a *permanent* finish to stainless steel and rustless iron, McAleer established the "standard of quality" and immediately became the country's leading source of supply.

McAleer's Stainless Steel Buffing Compositions are available in three grades: No. 6, medium dry, for small parts; No. 7, medium greasy, for flat parts; and No. 7-F-190, for miscellaneous work. In requesting samples, please specify which compositions are desired.

McALEER MANUFACTURING COMPANY

Lyndon and Prairie Avenues, Detroit, Mich.

GAS FOR HEAT WHEREVER HEAT IS NEEDED



CORE BAKING . . .

MORE and more foundries are coming inevitably to the use of gas heat for core and mold drying. They know gas is quicker, more thorough, more dependable—and best of all, less expensive than any other fuels. The new book "Gas Heat in Industry" tells all.

AMERICAN *Gas* ASSOCIATION

420 Lexington Avenue, New York

UNION SWITCH

DROP AND UPSET FORGINGS

Do the forgings you are now using meet your exact specifications? Do they give the best service possible? Are they accurate and economical? If not, put your forging problems up to UNION SWITCH.

The fact that we have served many of the most discriminating buyers in 48 years, is proof that we can serve you satisfactorily.

Simple or intricate forgings up to 500 lbs.—in any grade of steel—any quantity.

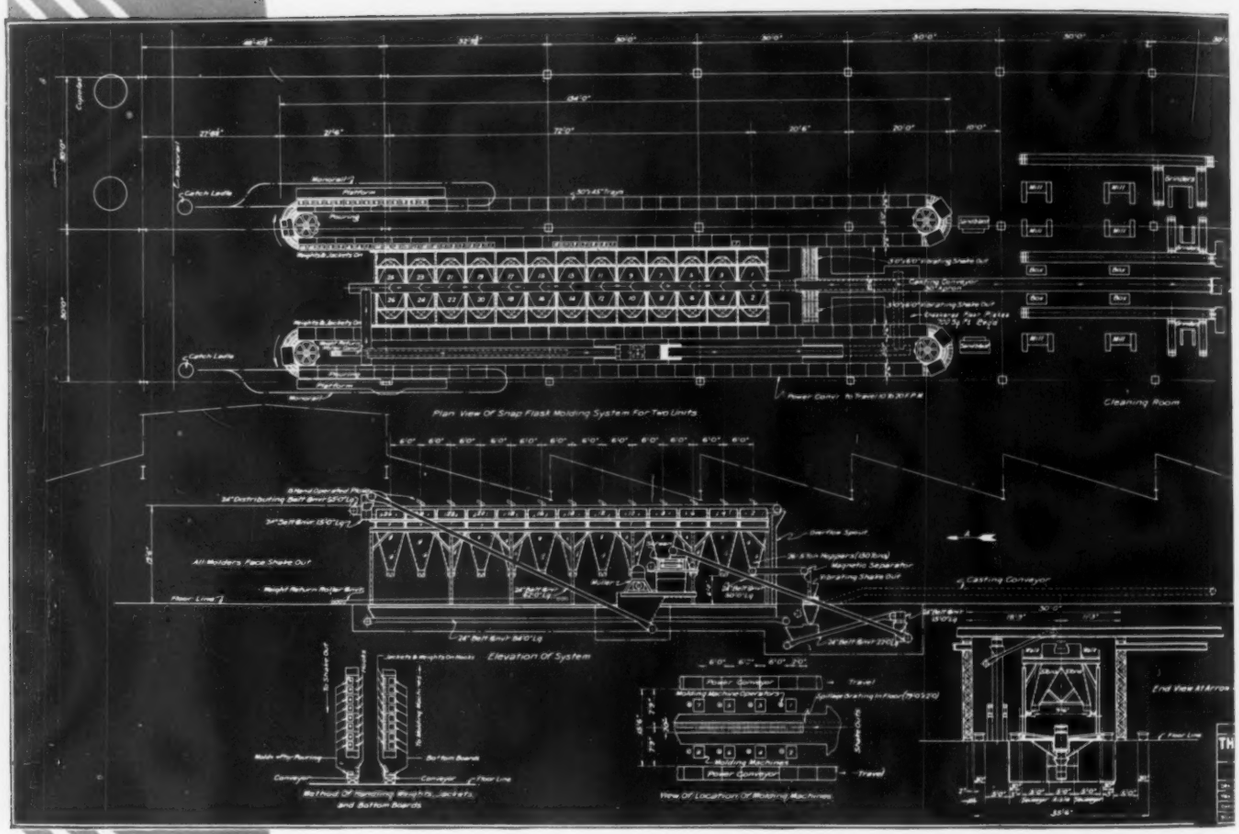
UNION SWITCH & SIGNAL CO.

DROP FORGE DIVISION

PITTSBURGH DISTRICT SWISSVALE, PA.

Your drawings will receive the attention of our engineers.

A "SNAP FLASK"


Plan View Of Snap Flask Molding System For Two Units
Elevation Of System
View Of Location Of Molding Machines
Cleaning Room

A typical molding floor layout — a Beardsley & Piper planned presentation of the most practical solution for a large "snap" mold installation. Space economy, maintenance elimination and high production with a minimum of labor are features of this layout planned by Beardsley & Piper Engineers.

Modifications of this plan for larger or smaller production and typical layouts on almost every size and type of work will be submitted to interested parties. No obligation is involved.

The Beardsley & Piper Line of Specialized Foundry Equipments includes Sandslingers, Sandmullers, Portable and Stationary Magnetic Separators, Sandarators, Shake-out Units, Apron and Belt Feeders, Conveyors, Turntables, Hoppers and other accessory equipments.

MOLDING SYSTEM

More and more foundries are modernizing their "snap molding" departments to take advantage of the many savings that accrue to sand preparation and efficient sand and mold handling systems.

Correct sand preparation results in smooth finish, high quality castings, a reduction of drops, run-outs, scabs and blows.

Efficient handling reduces labor costs, increases production, saves floor space, minimizes handling and allows for accurate control of all molding elements.

The layout presented here is a typical Beardsley & Piper "Snap Molding" System designed for high production of medium to small sized molds. Sand is handled and prepared mechanically. Moisture and temperature are easily controlled. Shot and tramp iron is magnetically eliminated. Mulling and screening for all sand preparing operations are automatic and continuous.

This arrangement provides for maximum production in a minimum of floor space—each operation is coordinated with each succeeding operation, eliminating lost motion, unnecessary handling and a waste of time and labor.

The general idea of this layout is flexible enough to allow for its use on systems smaller or larger than that shown and where application requires changes to provide for special conditions, Beardsley & Piper Engineers will redesign this layout or plan an entirely new arrangement that will ideally meet the requirements.

We are foundry specialists, manufacturers of foundry equipment, designers and builders of sand and mold handling systems, Sandslingers, Sandmullers and other equipments exclusively for foundry use.

It will profit you much to allow Beardsley & Piper Engineers to plan your entire foundry system for you.

THE BEARDSLEY & PIPER COMPANY

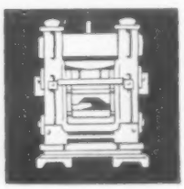
Sand Conditioning, Conveying and Molding Equipment

2541 NORTH KEELER AVENUE CHICAGO, ILLINOIS

Representatives in Principal Foreign Countries

Can you get service like this from your castings?

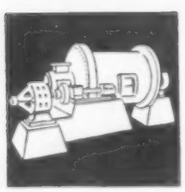
Compare these typical cases of casting performance with what you are getting from castings on your own equipment and then check the physical properties of Meehanite shown below.



ROLLS—Shovel points $\frac{3}{16}''$ thick at a cherry red heat are rolled in a mill equipped with Meehanite Metal Rolls. Although production is 1200 per day, the Meehanite rolls require grinding only once every eleven months. They last five years. The chilled iron rolls previously used in this service had to be ground every three months and replaced every year and a half.

GRATE BARS—Meehanite grate bars on a Dwight-Lloyd sintering machine have already lasted twice as long as the best grade of malleable iron bars previously obtainable.

PUMP HOUSINGS—Acid pump housings made of Meehanite, serve 10 times as long as gray iron housings when handling acid at 92° to 140° Be. and twice as long with acid of 58° to 62° Be.



PINIONS—The semi-steel pinions on a 7′ x 6′ ball mill which had an average life of only 10 days, were replaced by Meehanite pinions which are normally lasting 102 days in the same service.

Write to the nearest Institute member for details on your particular casting problem.

METAL

U. S. Patent Nos.: 1,449,065 • 1,683,087 • 1,683,086 • 1,731,346. Canadian Patent Nos.: 234,933 • 287,903 • 304,254. Other patents pending.

PHYSICAL PROPERTIES

Castings made under the Meehanite Process are superior to other irons. They have:
Greater Strength and Toughness.
More uniform grain Structure and Hardness.
Greater Resistance to Abrasion.
Greater Density.
Higher Resistance to Corrosion.
Freedom from spongy regions regardless of casting section.
Better Machinability.

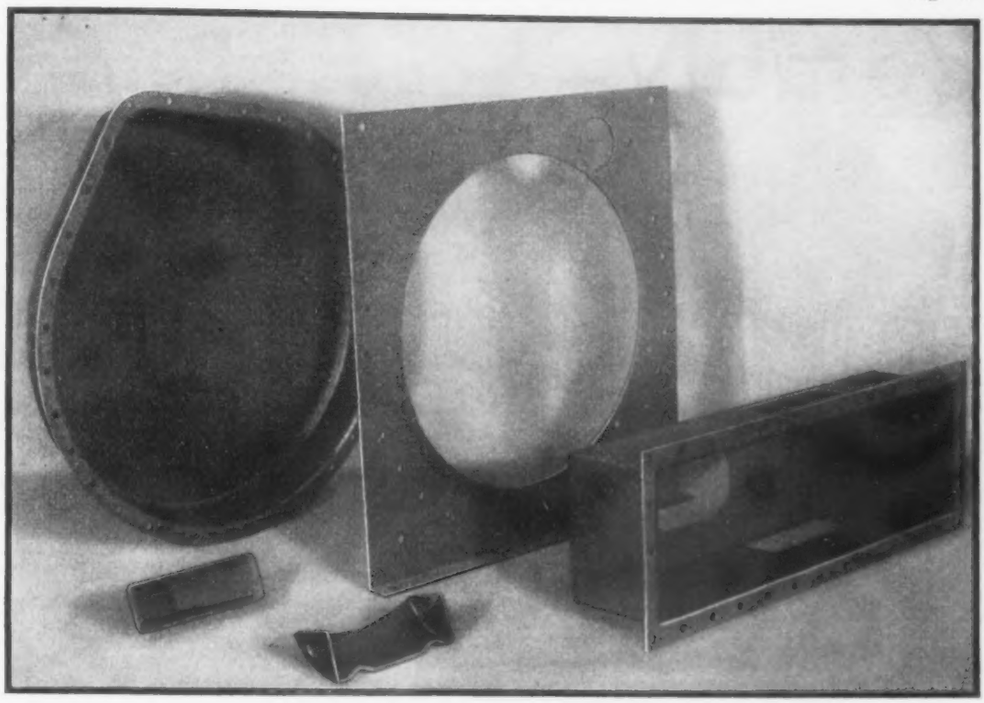
Specific properties obtainable on specification:

Tensile Strengths to 50,000 lbs. without heat treatment.
Tensile Strengths to 70,000 lbs. with heat treatment.
Brinell Hardness up to 600 by heat treatment.
Six times the impact strength of semi-steel.

MEEHANITE INSTITUTE

MEEHANITE FOUNDRIES

ANSONIA, CONN. . . . . Farrel Birmingham Co.
CHATTANOOGA, TENN. . . . . Ross-Meehan Foundries
CHICAGO, ILL. . . . . Greenlee Foundry Co.
CLEVELAND, OHIO . . . . . Fulton Foundry & Machine Co.
DETROIT, MICH. . . . . Michigan Valve & Foundry Co.
INDIANAPOLIS, IND. . . . . Indianapolis Casting Co.
PHILADELPHIA, PA. . . . . H. W. Butterworth & Sons Co.
PITTSBURGH, PA. . . . . Rosedale Foundry & Machine Co.
ST. LOUIS, MO. . . . . Banner Iron Works
TRENTON, N. J. . . . . Trenton Malleable Iron Works
TORONTO, ONT. . . . . Dodge Manufacturing Co.
TORONTO, ONT. . . . . Jessop Steel Company



Again Bossert points the way to Greater Profits

Redesigning these meter parts resulted in materially lowered cost and in much lighter weight

A PROMINENT meter manufacturer, who had always made cast iron meters, asked for Bossert help to develop a 10,000 cu. ft. meter. Bossert engineers went to work with the manufacturer's engineers. The use of pressed steel made possible a design which would have been entirely impossible with cast iron.

The design of Bossert stampings materially cut down weight. Yet they sacrificed none of the strength needed to withstand internal pressures and external knocks. They permitted a design which eliminated an intricate and expensive casting, and reduced machining to a minimum. Stampings, as furnished by Bossert, reduced the width of this meter, making it possible to manifold several meters, where large volume is encountered, with a saving of valuable floor space.

The Bossert plant is equipped to handle stampings from .005" to 1" in thickness. Complete facilities provide for welding, plating, polishing and assembly. Large plant capacity assures quick delivery on volume production.

Whether you desire to replace castings with lighter, stronger, trimmer stampings or to improve stampings you now use, you are invited to call in Bossert engineers for a frank discussion of your problems. This service is yours without obligation.

Send for the Bossert Book

An interesting booklet, "Metal Stampings," which outlines the Bossert service to industry, will be sent to you free upon request. Write for a copy.

THE BOSSERT CORPORATION
1405 Lenox Avenue Utica, New York
New York Cleveland Detroit

BOSSERT STAMPINGS

Assembly—Square Pegs and Round Holes • • or *Pressed Steel and Precision* ▼ ▼ ▼ ▼

Which is it in your factory?

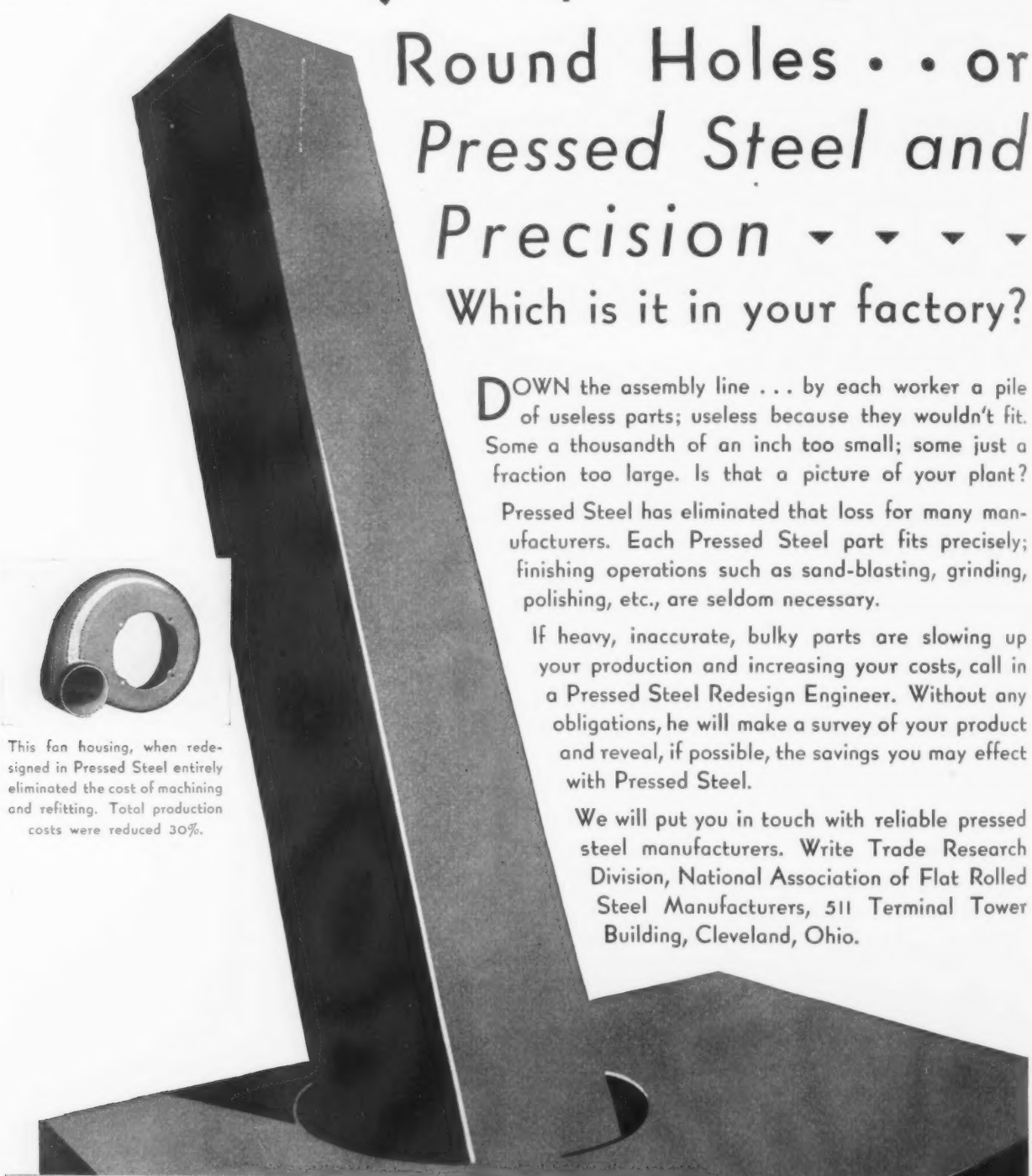
DOWN the assembly line . . . by each worker a pile of useless parts; useless because they wouldn't fit. Some a thousandth of an inch too small; some just a fraction too large. Is that a picture of your plant?

Pressed Steel has eliminated that loss for many manufacturers. Each Pressed Steel part fits precisely; finishing operations such as sand-blasting, grinding, polishing, etc., are seldom necessary.

If heavy, inaccurate, bulky parts are slowing up your production and increasing your costs, call in a Pressed Steel Redesign Engineer. Without any obligations, he will make a survey of your product and reveal, if possible, the savings you may effect with Pressed Steel.

We will put you in touch with reliable pressed steel manufacturers. Write Trade Research Division, National Association of Flat Rolled Steel Manufacturers, 511 Terminal Tower Building, Cleveland, Ohio.

This fan housing, when redesigned in Pressed Steel entirely eliminated the cost of machining and refitting. Total production costs were reduced 30%.



Save - Labor Time Money with Pressed Steel

This electric hair dryer is a typical example of G. P. & F. engineering skill in fitting a product to meet new demands. Stamped from aluminum and highly finished, the hair dryer housing is light in weight, neat and beautiful in appearance.

Yours may be different.. *but is it* more intricate?

THE unusual experiences we have had in our 50 years of manufacture of pressed metals have taught us one thing. There is no telling what part of your product can be handled by the stamping process, more satisfactorily, far more economically until you have consulted experienced stamping engineers.

Take, for example, the electric hair dryer case pictured above. Previous to its manufacturer coming to us, there seemed no other way of producing it but by casting. Yet in spite of its intricacy and small size, G. P. & F. Engineers secured the utmost accuracy, the high finish, the light weight, the neat appearance, the beauty, necessary for sales success.

From every angle, be it cost, improvement in design and appearance, or delivery, G. P. & F. can meet your requirements. Send for the booklet, "*In Harmony with Modern Progress,*" and a blueprint or sample for quotation. No charge, no obligation.

GEUDER, PAESCHKE & FREY CO.
Sales Representatives in Principal Cities in All Parts of the Country
1415 W. St. Paul Ave., Milwaukee, Wis.
338 W. Ohio St., Chicago, Ill.

G.P.&F. STAMPINGS

GEUDER, PAESCHKE & FREY CO.,
1415 W. St. Paul Avenue, Milwaukee, Wis.

Please send your new booklet "*In Harmony with Modern Progress*" to the address below . . . without charge or obligation.

Name.....

Company Name.....

Address.....

City.....*State*.....

A-4456

Questions to Ask when buying a Scale

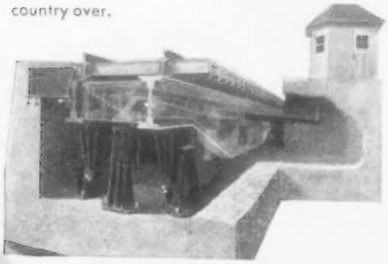
EVERY one of the questions listed below should be included in your formula for buying a scale. Every one of them has an important bearing on the satisfaction you get from your new weighing equipment.

Comparisons of the answers will give you a pretty reliable measuring stick by which to gauge the character and future behavior of the scales under consideration. Ask these questions and *insist on proof* in the reply.

Buffalo Scales welcome your investigation on each point listed; and on any other point which you may consider of either minor or critical importance.

1. How many parts has the suspension bearing? (*Simplicity contributes to low friction and high accuracy.*)
2. Are the pivots one-piece construction? (*One-piece pivots insure true bearing contact and cannot get out of line.*)
3. Does the scale platform move freely lengthwise as well as sideways? (*Free longitudinal motion protects pivots and bearings against thrust when loads roll on to platform.*)
4. Which parts are cast steel and which cast iron? (*Steel means added strength wherever it is used.*)
5. Will the scale weigh with equal accuracy on light loads, heavy loads, perfectly centered and off-center loads? (*Accuracy must include every condition of service.*)
6. What factor of safety is provided in the construction of the scale bridge? (*Overloading is common . . . the scale must be built to allow for it.*)

This is the Buffalo Two-Section Railroad Truck Scale which has given such remarkable service in the service of Railroads and Industries, the country over.



Buffalo Scale's Answers are Contained in Buffalo Scale Literature. For your own satisfaction—send for it today.

BUFFALO SCALES

"THE TRUSTWORTHY"

BUFFALO PITTSBURGH CLEVELAND CHICAGO
NEW YORK DETROIT PHILADELPHIA DALLAS

BLISS

ROLLING MILL EQUIPMENT
FOR
HOT OR COLD ROLLING

MILLS

MILL REELS

COILERS

SLITTERS

WINDING REELS

LEVELING MACHINES

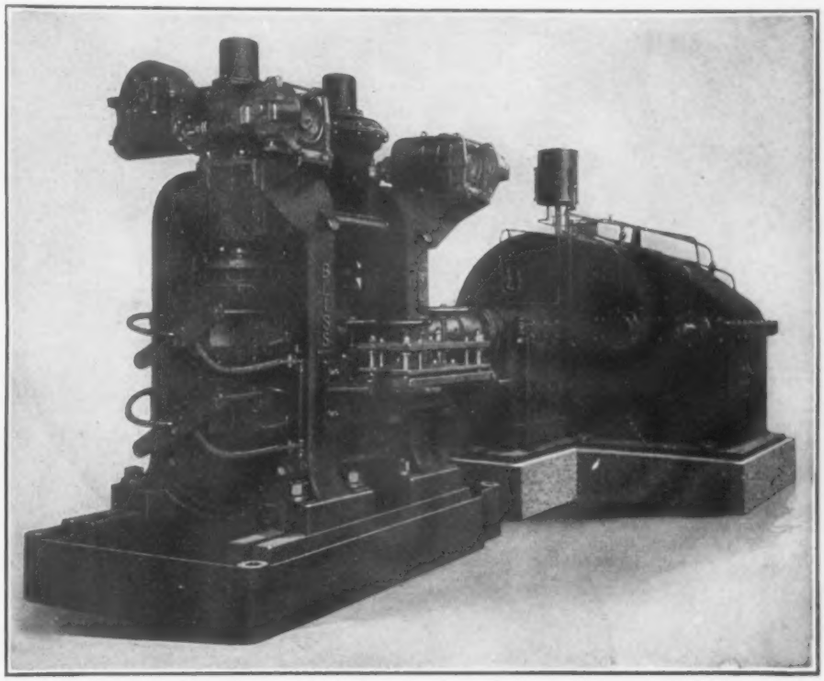
SHEARS

RECOILING MACHINES

SCRAP-BAILING MACHINES

ETC.

ETC.



BLISS TWO-HIGH MILLS
ROLLER-BEARING EQUIPPED

These mills are built in all sizes and roller-bearing equipped throughout.

Full details on request.

BLISS for MACHINERY

E. W. BLISS CO., BROOKLYN, N. Y., U. S. A.

Factories: BROOKLYN, N. Y. HASTINGS, MICH. SALEM, OHIO

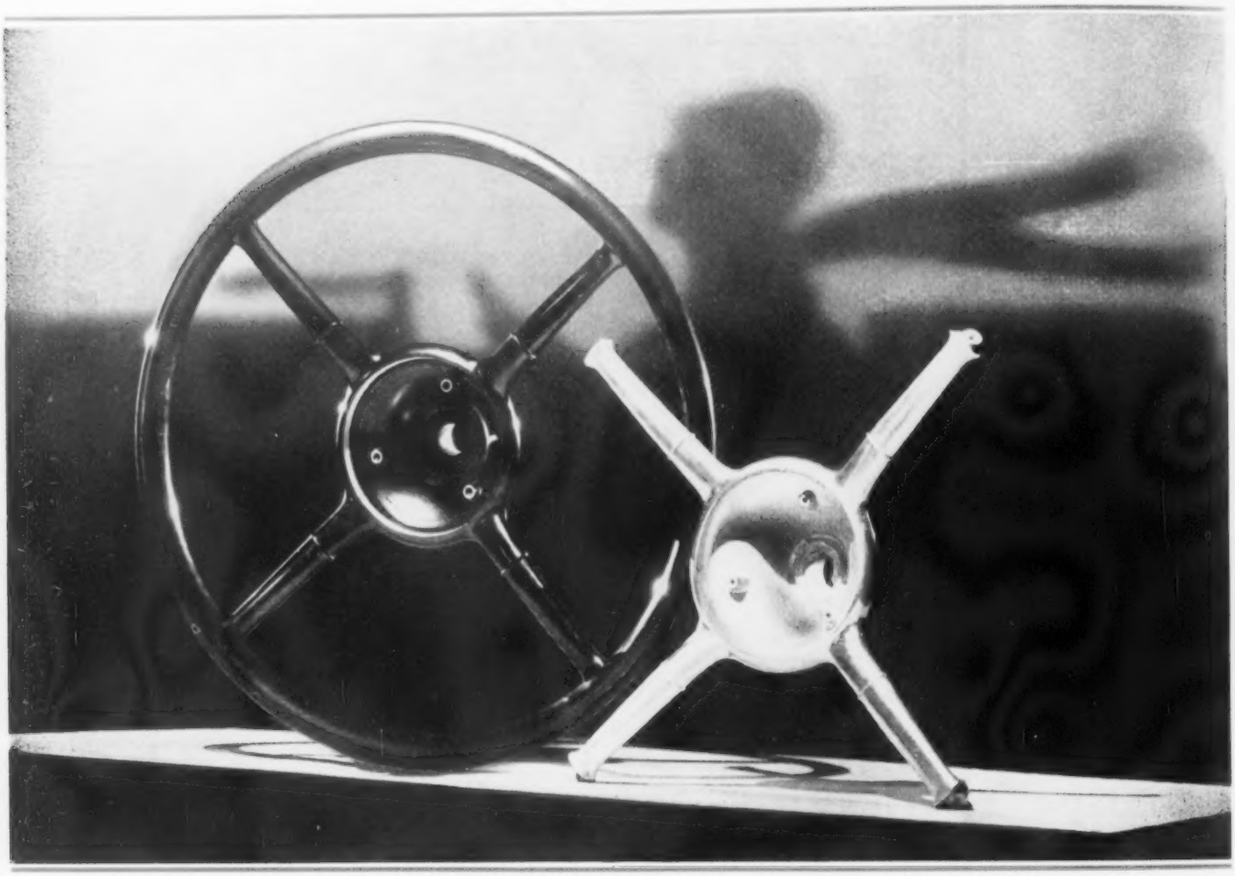
Sales Offices: DETROIT CLEVELAND CHICAGO ROCHESTER PHILADELPHIA CINCINNATI NEW HAVEN BOSTON

Foreign Factories and Offices: LONDON, Eng. TURIN, Italy PARIS, France

BLISS

No. 579

DIE-CAST BY STEWART



THIS RUGGED, ATTRACTIVE STEERING WHEEL, A DEPENDABLE STEWART DIE-CASTING

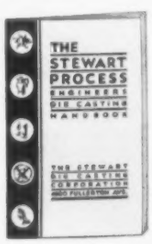
YES, you will find the steering wheel on one of America's finest and most popular motor cars a Stewart die-casting.

The automotive engineer takes no chances with die-castings he does not KNOW are always "right." There is too much at stake. And so he specifies—"die-cast by Stewart" four words that stand for quality, price and delivery.

Stewart has not only been giving reliable service for years, but will be for years to come. They are specialists in the adaption of parts and products to the die-casting process. Their plant is the largest and finest equipped in the world devoted exclusively to die-casting.

How about your product?

Why not let a Stewart engineer tell you about the possibilities of reduced cost and added quality for your product? A word from you will bring him. And, of course, with absolutely no obligation on your part.



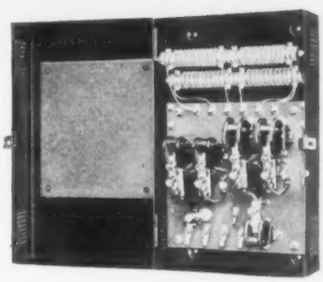
Send blueprints or samples of your product for an estimate. Or why not write for our new illustrated "Engineer's Die-casting Handbook?"

Stewart

THE STEWART DIE-CASTING CORP., 4531 Fullerton Ave., Chicago, Ill.

St. Louis, Mo., Detroit, Mich., Dayton, Ohio., Jamestown, N. Y.

Dollars, *dribbling away in Maintenance—* Save Them!



New Automatic Magnet Controller . . . Greater Lifting Capacity . . . Speedier Operation

Only two-wire, two-position master needed. Discharge-voltage actuates reverse-current switch. Operator simply moves lever to "Drop." His hand returns at once to crane-controls. Current is shut off, reversed, switch opened automatically. Current is off magnet on return trip, insuring cooler magnet, greater all-day lifting capacity, speedier operation. Furnished as standard on C-H Magnets 39" and larger; also suitable for other magnets 45" and larger.

WHEN a magnet "goes bad," it is not a matter of small repairs. It usually means a trip back to the factory, a virtual rebuilding . . . a long and costly absence from duty. Materials pile up . . . schedules are set back . . . profits sneak away disguised as costs.

For long, dependable service, Cutler-Hammer "Red Top" Lifting Magnets present an enviable record; they stand up on the hardest of applications for 10 and 15 years without a single shut-down for repairs. In one plant* near Chicago, two competing magnets served alongside a C-H "Red Top" on skull-cracker service. The cases of the competing magnets broke inside of two years. The C-H Magnet is now in its 10th year of uninterrupted service. In a Pennsylvania mill,* a C-H "Red Top" handled hot billets continuously for 17 years without trouble.

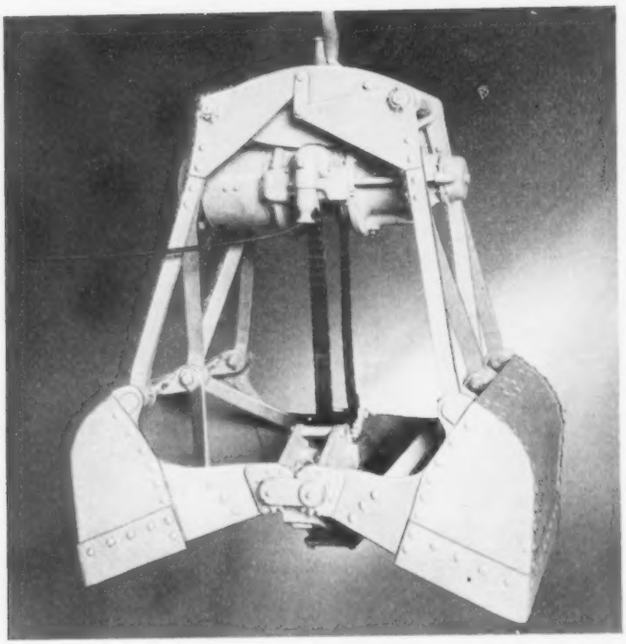
Such is the service, the construction, the unfailing dependability, the resistance to trouble you secure in C-H Magnets. The why's and wherefores are detailed in the booklet "*Modern Metal Handling Methods.*" Send for a copy. CUTLER-HAMMER, Inc., Pioneer Manufacturers of Electric Control Apparatus, 1262 St. Paul Avenue, Milwaukee, Wisconsin.

*Name on request

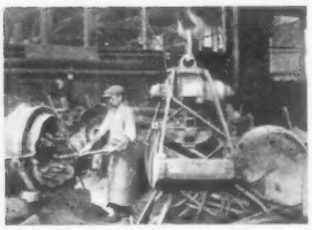
CUTLER HAMMER

Red Top Heavy Duty Lifting Magnets

(A-4062)



One bucket for many jobs



A Hayward Electric Motor Bucket handling scrap

In this foundry, the Hayward Electric Bucket handles sand, coke, limestone

And here the bucket works at unloading cars

THERE is lots of work in the foundry for a bucket. Sand to be handled. Pits to be dug. Slag to be moved. Each of these is a job for this sturdy Hayward Electric Motor Clam Shell.

The closing power of this Hayward is vested entirely in the self-contained electric motor. One man, with a lever, controls the bucket. Alemite lubrication insures smooth, quick response. Forged steel connecting rods, diagonally braced; bronze bushed bearings and shafts of high carbon turned steel are just a few of the numerous extra-value Hayward features which give the bucket strength and stamina.

When there is bucket work to be done, do it the Hayward way . . . with this modern Electric Motor Bucket.

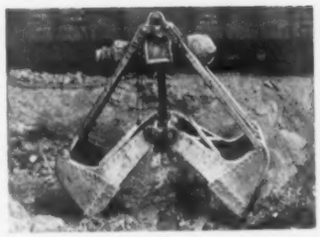
Having four different types of digging and rehandling buckets to draw from makes a Hayward recommendation absolutely unbiased.

THE HAYWARD COMPANY

46-50 Church St., New York, N. Y.

Cleveland, Chicago, San Francisco

ELECTRIC MOTOR
ORANGE PEEL
CLAM SHELL
DRAG LINE

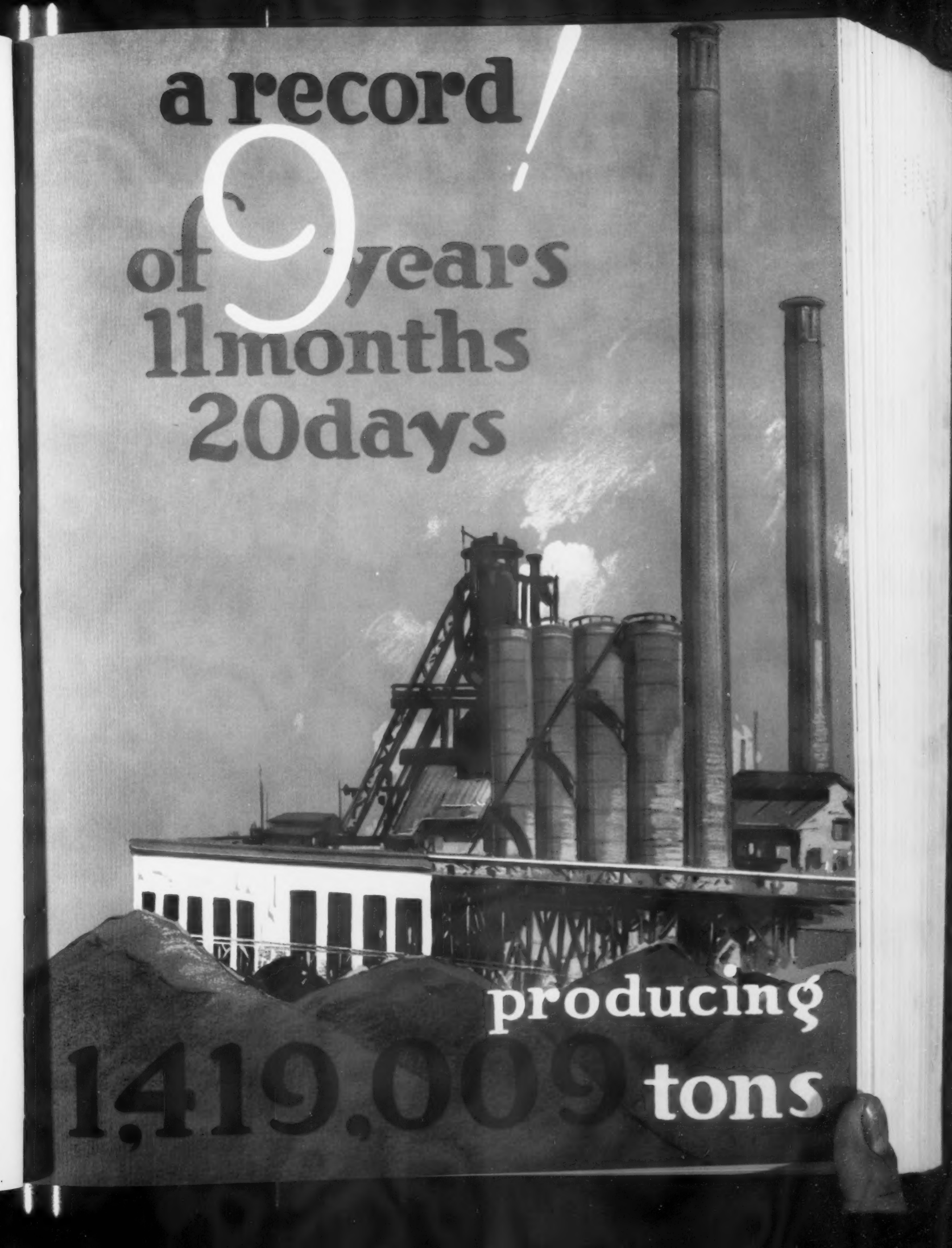


Digging slag . . . tough work? A cinch for the Hayward Electric Bucket

Moving coal from stock pile to boilers

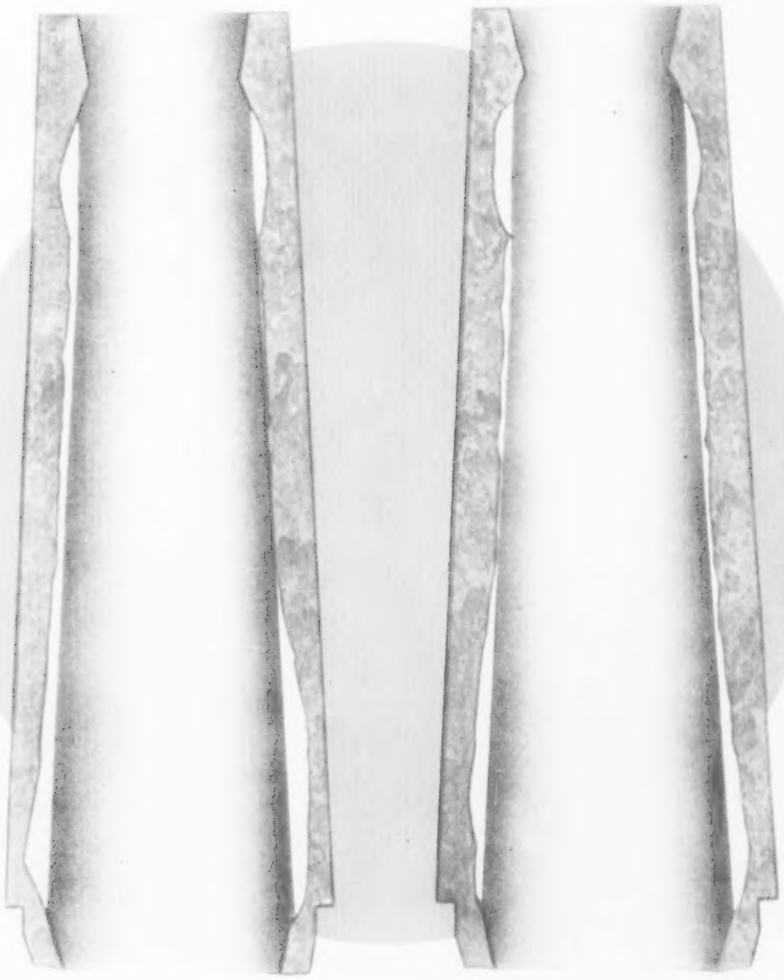
Feeding coal to a crusher

Hayward Buckets


a record!
of 9 years
11 months
20 days
producing
1,419,009 tons

—WITH AN OLIVE HILL* BLAST FURNACE LINING

THIS IS THE RESULT—



*An exclusive General Refractories brand.

Section—East and West

Section—North and South

NOTE the condition of the OLIVE HILL* Blast Furnace Lining after this remarkable campaign—it could have produced a still greater tonnage.

—and during this record campaign, the furnace was blown out twice, and banked twelve times **without brick repairs of any kind.** Within the last month it even broke the monthly and weekly production records.

OLIVE HILL* Brick is constantly providing an extra measure of service to blast furnace operators throughout the world.

GENERAL REFRACTORIES COMPANY

106 SOUTH 16TH ST., PHILADELPHIA, PA.

District Offices: Birmingham Boston Buffalo Chicago Cleveland Detroit Indianapolis New York Pittsburgh St. Louis San Francisco

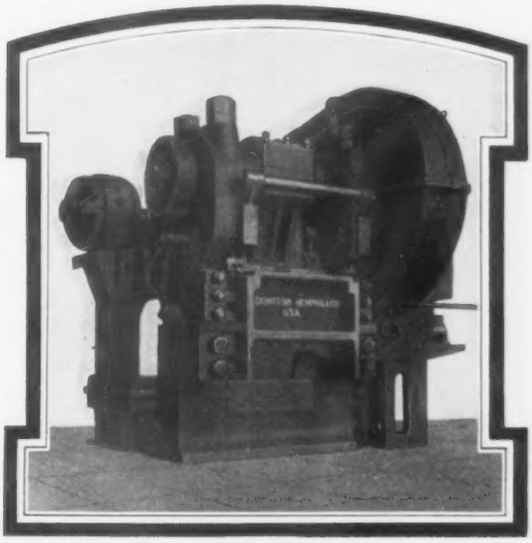
Representatives: Seattle Montreal Havana, Cuba

4776

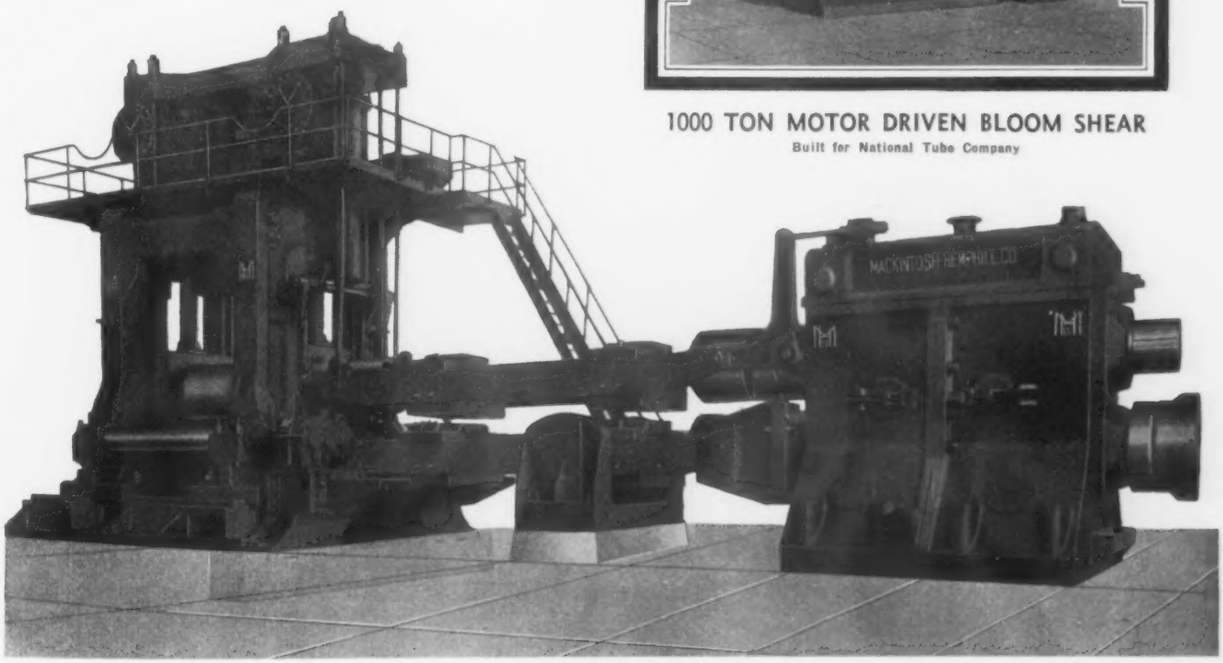
MACKINTOSH-HEMPHILL

"THE BEST IN ROLLING MILL MACHINERY"

ROLLS
ALLOY CASTINGS
GEARS



1000 TON MOTOR DRIVEN BLOOM SHEAR
Built for National Tube Company



48" BLOOMING MILL
Built for Illinois Steel Company

MACKINTOSH-HEMPHILL COMPANY

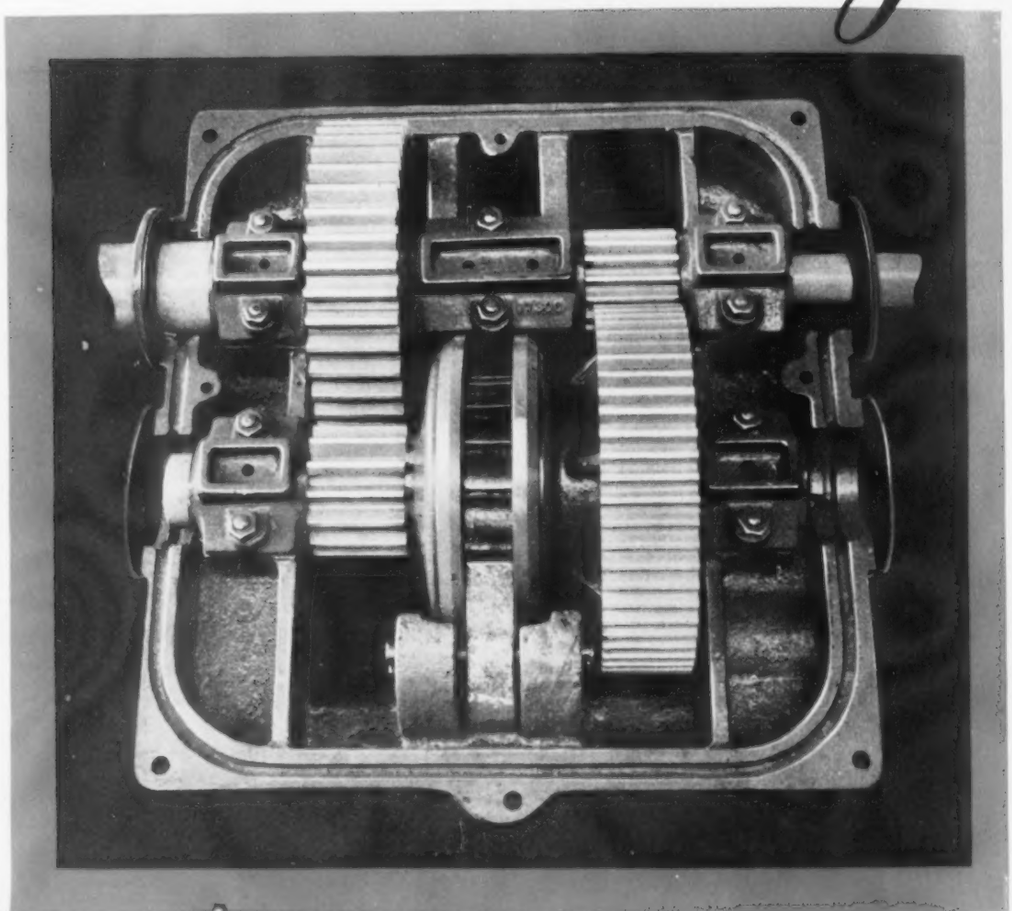
ESTABLISHED 1803 AT PITTSBURGH

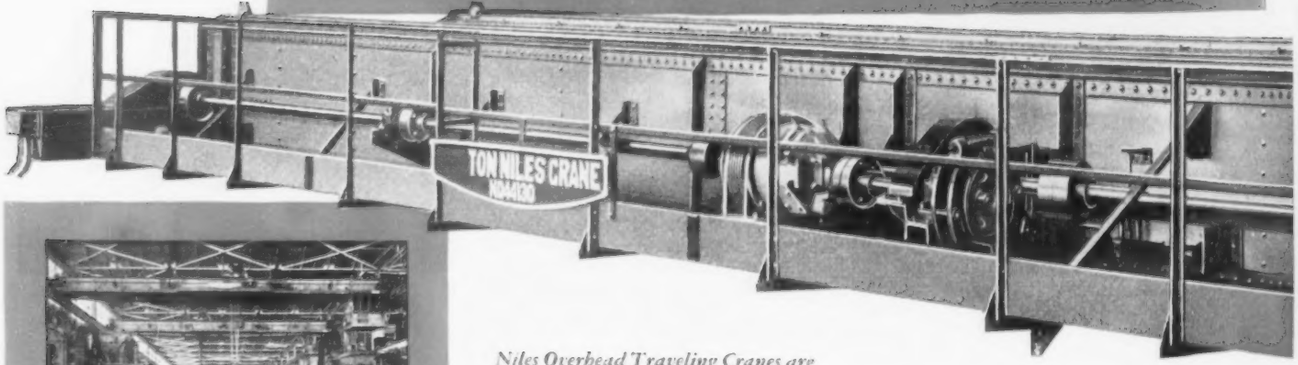
PIONEERS—ENGINEERS—BUILDERS

General Offices:
POINT BUILDING—PENN AVENUE AT WATER STREET,
PITTSBURGH, PA.

GARRISON DIVISION, PITTSBURGH, PA.
MIDLAND DIVISION, MIDLAND, PA.
WOOSTER DIVISION, WOOSTER, OHIO.

Only





Niles Overhead Traveling Cranes are built in capacities from 10 tons to 450 tons for practically every service to which an overhead traveling crane can be applied. Niles also builds Gantry Cranes, Wall Cranes, and Hand Power Cranes.

NILES CRANES

DIVISION OF

SHEPARD NILES CRANE & HOIST CORPORATION, *Montour Falls, N. Y.*

NILES

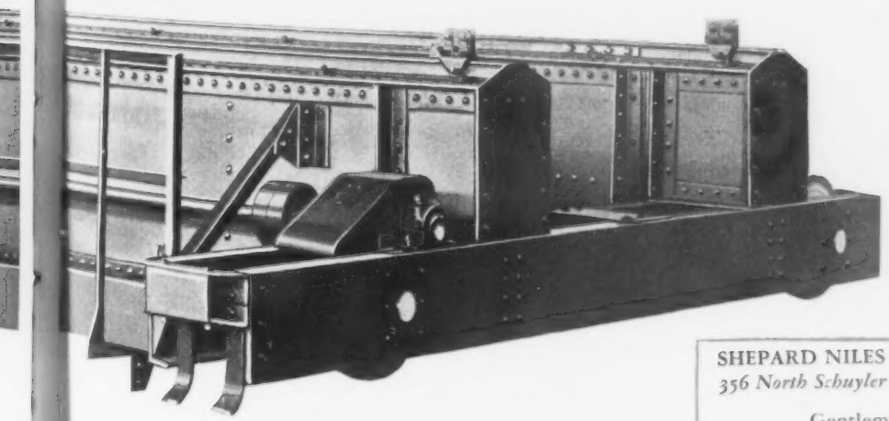
has This!

...the compact reduction-gear and load-brake trolley

ALIGNMENT is lasting in this Niles design. All of the bearings are integral with the steel casting that houses the high speed reduction-gears and the load-brake. All of the bearings are within the housing. This assures a perfectly sealed closure and continuous lubrication from the oil bath within the housing. Because of this design, gears, load-brake and bearings alike can be observed in operation with the cover removed. Original alignment and perfect functioning of all parts can be accurately checked. Niles construction makes certain that the original predetermined relations of all moving parts will be maintained even in the most severe service.

This contribution to spur gear trolley design is typical of the competence of Niles engineering. Throughout the trolley, and the crane bridge, the accumulated experience of long years of crane building is evidenced. And the ever increasing host of satisfied users confirms the soundness of Niles design.

Details of design and construction are given in Niles Bulletins 100 and 101. The coupon is for your convenience in obtaining copies.



THE MOST COMPLETE LINE OF CRANES AND HOISTS IN AMERICA

SHEPARD NILES CRANE & HOIST CORPORATION
356 North Schuyler Ave., Montour Falls, N. Y.

Gentlemen: Please send copies of the Niles Bulletins No. 100 & 101 to:

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Company _____

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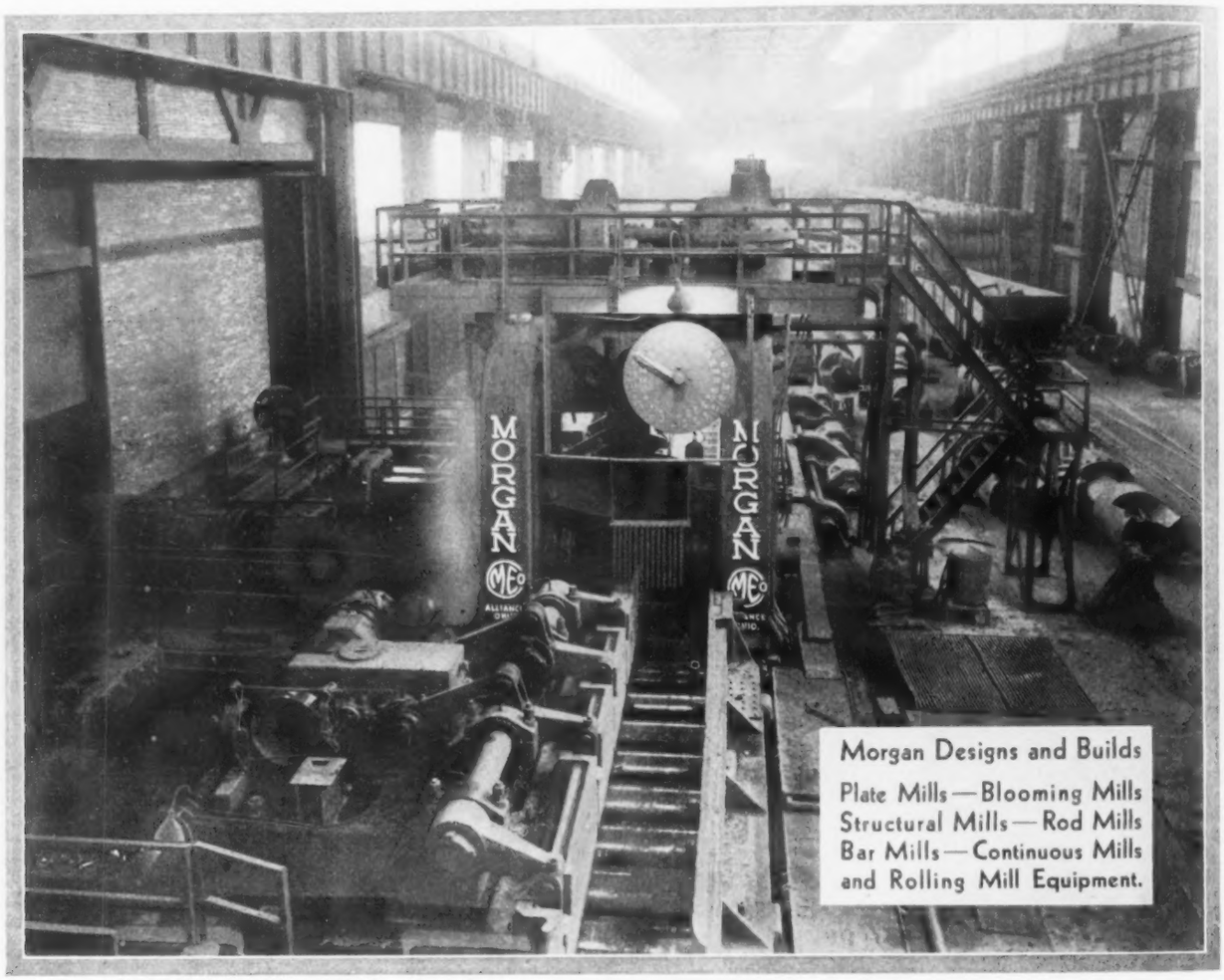
MORGAN 54" BLOOMING MILL



54" Blooming Mill — Designed and Built by Morgan

Mill housings are one-piece steel castings—assuring extreme rigidity.

Two cylinder roll balance is used, thus requiring minimum head room.

Manipulator is of the overhead type, compact and simple. Finger lifts and side guards are each operated by two motors in series—assuring very quick acceleration.

FOR MILL INFORMATION WRITE FOR BULLETIN No. 16

THE MORGAN ENGINEERING COMPANY

NEW YORK 25 BROADWAY — **ALLIANCE, OHIO, U.S.A.** — PITTSBURGH 1420 OLIVER BLDG.

Designers - Manufacturers - Contractors

Steel Plant Equipment - Forge Shop Equipment - Special Machinery Of All Kinds

HOAGLAND CHILLED IRON ROLLS

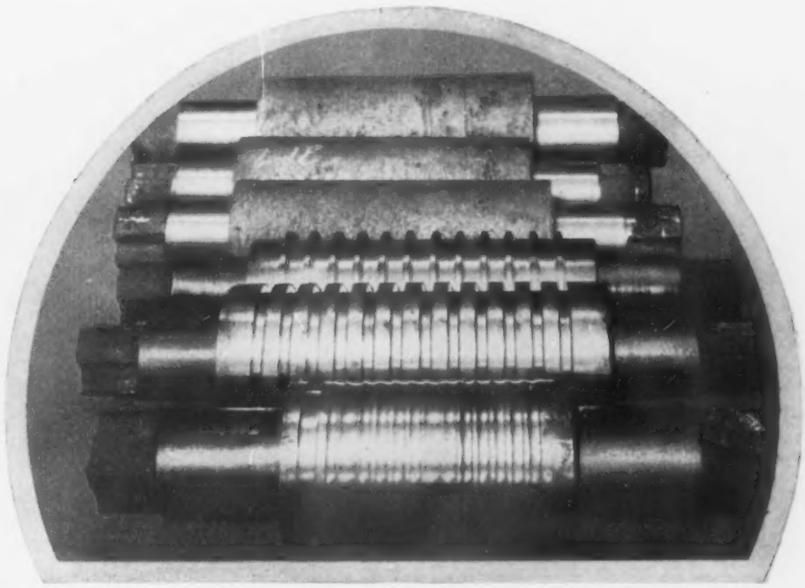
IN COMPETITION

Hoagland Rolls

Rolled 70987-250 lb. billets over a period of four months without refinishing.

A Well-Known Alloy Roll

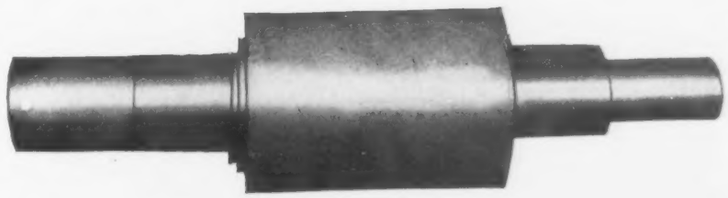
Rolled 58298-250 lb. billets—lasted only three months without refinishing.



A Group of Hoagland Finished and Unfinished Rolls

Recently, in a competitive test conducted by a reliable company, Hoagland chilled iron rolls rolled 12,689 *more* billets and lasted a month *longer* than an alloy roll before refinishing was required. Hoagland's long experience in the manufacture of rolling mills, rolling mill equipment, and chilled iron rolls is readily noticeable in the better design, higher production, and longer life of this equipment.

A complete engineering service is available for your special requirements. May we have the pleasure of serving you?



Rubber Roll

M. HOAGLAND'S SONS CO.

ESTABLISHED 1840

BUILDERS OF ALL TYPES OF METAL & RUBBER ROLLING MILLS & EQUIPMENT—ALLIGATOR SHEARS, WIRE COILERS, CAST IRON CHILLED ROLLS, UNIVERSAL MILL COUPLINGS

ROCKAWAY, N.J.

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52 times a year America's Metal Working Industry passes in review through the editorial and advertising pages of The Iron Age, — its Preferred Publication.

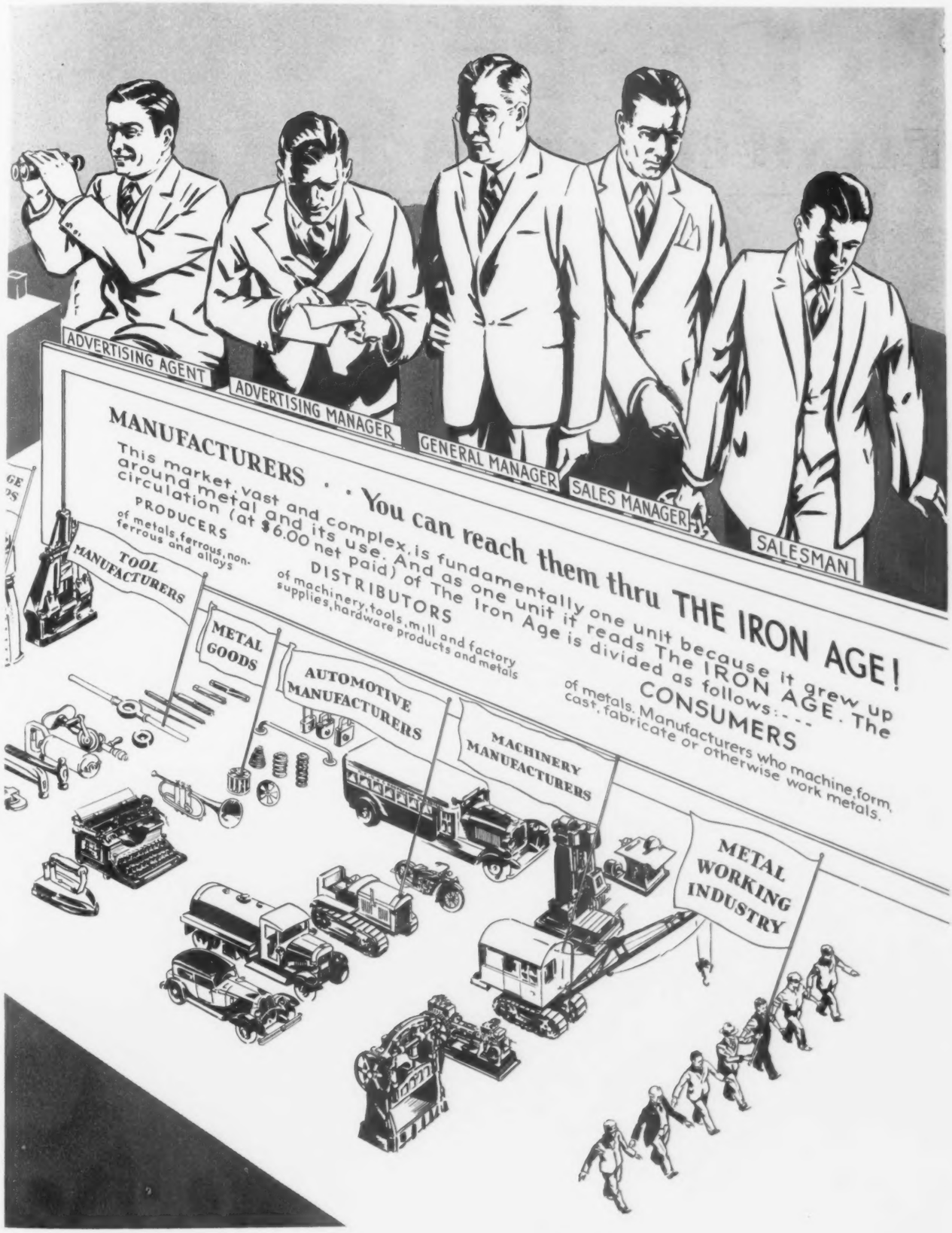
NOW—in 1931—The Iron Age offers those who sell products or services of value to America's greatest industry an advertising opportunity unparalleled by any other publication. Why?

Because The Iron Age is the one publication that supplies a common meeting ground for all who produce, fabricate, consume or distribute metal and its products.

That The Metal Working Industry itself recognizes the indispensable service of The Iron Age and its advertisers, is shown by repeated surveys which prove that The Iron Age is the Preferred Publication.

THE IRON AGE

MANAGEMENT ◆ PRODUCTION ◆ PROCESSES


ADVERTISING AGENT
ADVERTISING MANAGER
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MANUFACTURERS . . You can reach them thru THE IRON AGE!
This market, vast and complex, is fundamentally one unit because it grew up around metal and its use. And as one unit it reads The IRON AGE. The circulation (at $6.00 net paid) of The Iron Age is divided as follows:---
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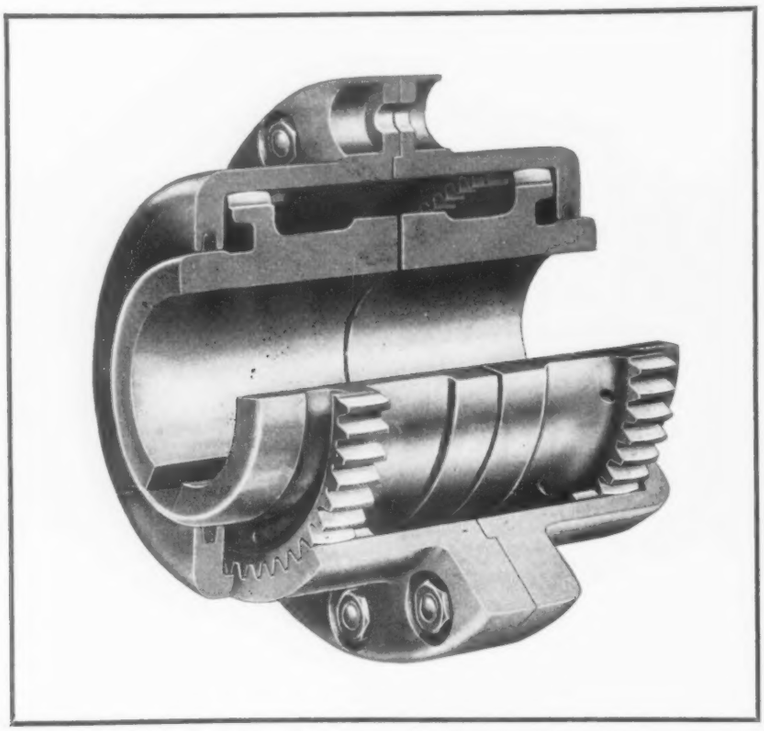
DESIGN ◆ NEWS ◆ MARKETS ◆ DISTRIBUTION

POOLE
FLEXIBLE COUPLINGS



ANNOUNCING
A NEW MODEL

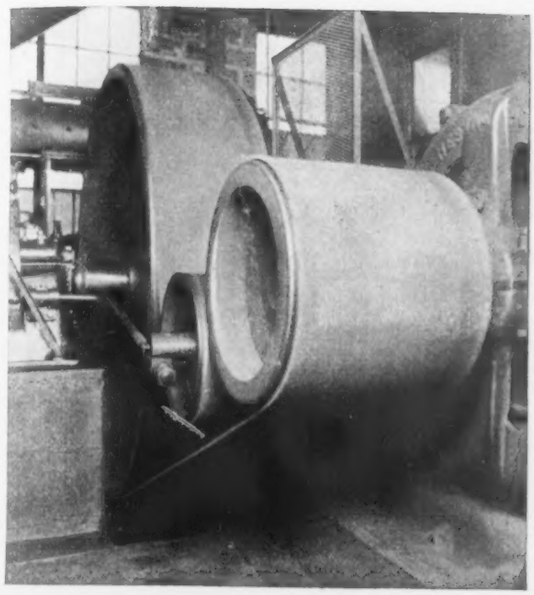
MEDIUM DUTY TYPE

We have been frequently called upon in the past to supply a less expensive model for light and medium duty service. To meet this increasing demand we have added the New MEDIUM DUTY TYPE to our line of well-known Flexible Couplings.

It incorporates the same general features, and all Poole construction found in our heavy duty types—providing the highest efficiency of modern flexible coupling design for light and medium duty service. Self-adjusting, permits free floating action without strain to bearings, shafts or other parts. This model is particularly adaptable to drives such as pumps, fans, small compressors, small generators, blowers, conveyors, elevators, and all other types of light or medium duty machines.

Bulletin III gives full details of the Medium Duty Type. Other standard types are illustrated in our Flexible Coupling Hand Book. Both sent upon request.

POOLE ENGINEERING & MACHINE CO.
Baltimore **Maryland**

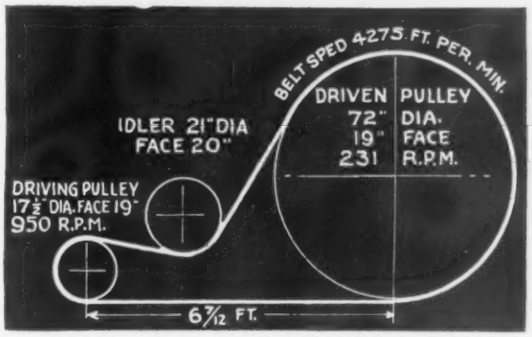


When You Buy
VIM Leather Belting
You Buy
Power Transmission

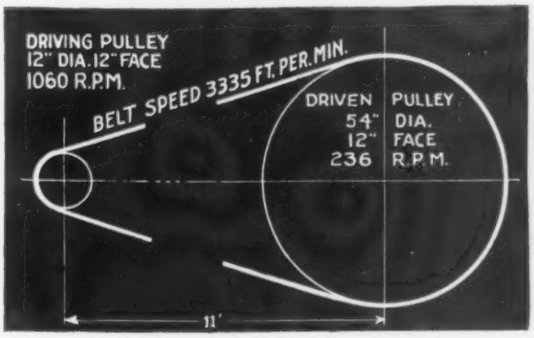
ALL Houghton products are backed by the three-fold guarantee of quality, uniformity and service.

In the case of V I M Leather Belting, Houghton offers you more than a belt—it offers you power transmission. This includes not only the world's highest grade belt—VIM, but the advice and experience of the Houghton Research and Transmission Engineers—admittedly the world's leading authorities on power transmission problems.

Frequently Houghton Engineers are able to make specific recommendations whereby through a slight change of a pulley, altering a shaft arrangement, or some other simple procedure, power and transmission economies amounting to thousands of dollars are assured. Such advice and recommendations form a part of the Houghton service. You are entitled to this service whenever you purchase a VIM Belt—or contemplate purchasing one.



For over 8 years an 18 in. double VIM Leather Belt has handled this 100 H.P. drive on an air compressor. This belt is still on the job and in excellent condition. The belt it replaced only lasted ten months. Install VIM and forget your belt troubles.



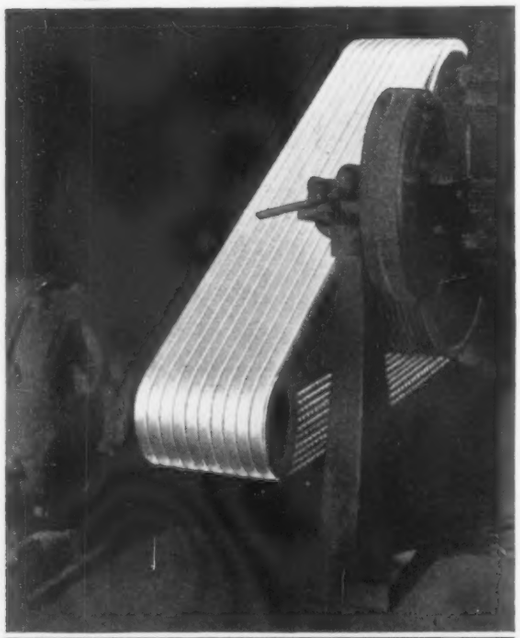
4 years, 4 months and 17 days was the life of the first 10 in. double VIM Leather Belt on this drive, pulling 50 to 60 H.P. The belt pulls a Sturtevant mill running 24 hours a day under very dusty conditions. 30 days was the average life of the belt previously used.

E. F. HOUGHTON & CO.

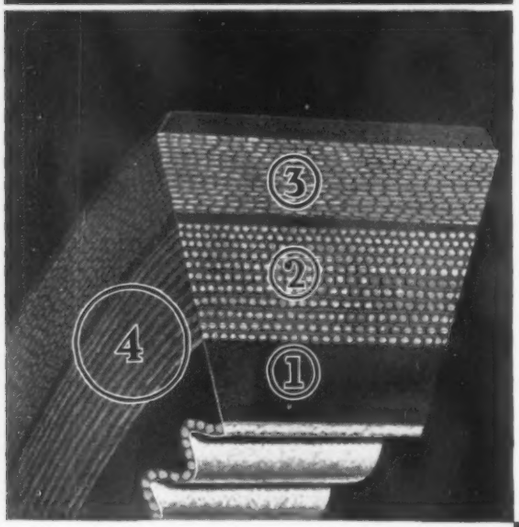
Philadelphia, Pa. - - And All Over the World

VIM LEATHER will outpull any other belting material made. MAKE US PROVE IT

Here's the Drive



COMPLETE DRIVES—PULLEYS AND BELTS—
IN STOCK. ALL RATIOS, 2 H. P. TO 100 H. P.



1. The Cog Section—for extreme flexibility at high speeds, without heating, distortion, buckling or rippling. Daytons are "built to bend."
2. The "Neutral Axis"—the strength section. Permanently pre-stretched by Dayton's patented process.
3. The Outer Section—gives balance. Composed of layers of vulcanized, strong cord fabric, bias-cut to accommodate bending without strain or distortion.
4. The entire belt is die-cut for precision. Daytons are accurate and *stay* accurate.

FOR MORE EFFICIENT POWER TRANSMISSION

■

DAYTON COG-BELT DRIVES REVOLUTIONIZE MACHINE OPERATION

Do you realize that with Dayton Cog-Belt Drives you can revolutionize the performance of all types of machinery—at extremely low cost? And do you realize that by doing away with old-type drives and installing Dayton Cog-Belt Drives, you'll make your production a far easier, sounder and more dependable operation?

Install Dayton Cog-Belt Drives—
Get the benefit of these features

1. Easy on bearings. Greater gripping power permits less tension. **2. Positive Speed.** Firm grip and permanent pre-stretching enable you to set *and maintain* exact speed ratios. **3. Smoother Starting and Running** . . . through seating action of belts in pulley grooves. Belts are die-cut. They don't buckle, squash, or turn over in the pulley grooves. **4. Vibration Eliminated. 5. Minimum Space Required.** Smaller pulleys. Short center-to-center distances possible without idlers. **6. Rugged . . . Quiet . . . Clean . . . Cool.** No oil or grease to collect dust. Not affected by moisture. And Daytons run without heating . . . they're "built to bend." **7. Less Adjustment and Maintenance.** Longer life. No lubrication necessary. No dressing. ● But see for yourself that this is the drive for your machines. Send for a Dayton Cog-Belt catalog and a sample section of the belt. Write today for information.

THE DAYTON RUBBER MANUFACTURING CO.
DAYTON, OHIO

Factory Distributors in Principal Cities and All Westinghouse Electric and Manufacturing Company Sales Offices

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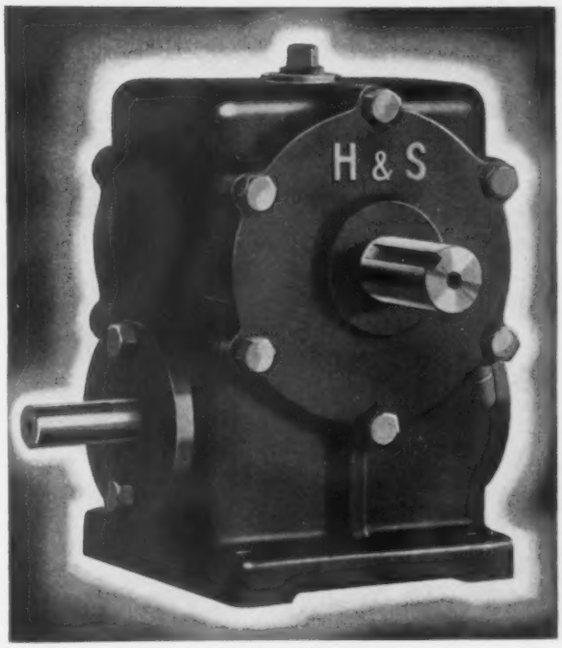
Dayton
COG-BELT DRIVES

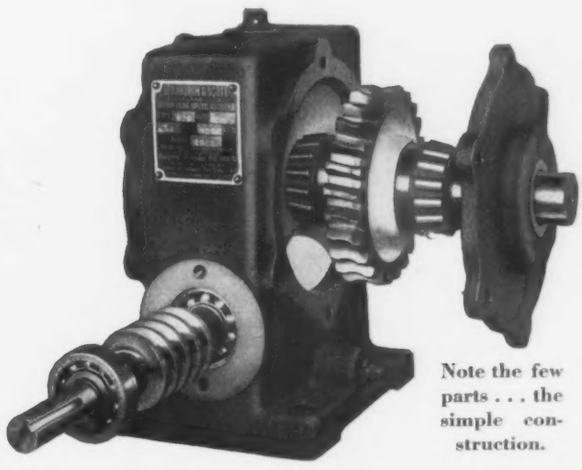
Greater Capacity in these Small Speed Reducers . . .

HERE is a proven, reliable and economical small speed reducer . . . designed and built to fill a want that has long existed for a unit as efficient . . . as free from trouble as the larger sizes.

In the WB 600 and WB 700 Speed Reducers, you secure advantages heretofore available *only* in the larger Horsburgh & Scott Units. They are self-lubricating . . . rugged . . . occupy extremely small space . . . and with large reductions permit the use of less bulky, more economical high-speed motors. Furnished in standard ratios from 3⅝ to 1 up to 60 to 1.

Your inquiry involves no obligation—and may lead to considerable savings.





Note the few parts . . . the simple construction.

FOUR OUTSTANDING ADVANTAGES

1. Worm is forged integral with the shaft insuring rigidity and absolute concentricity.
2. Worm threads are hardened to glass hardness. Top, bottom and sides of threads are accurately ground after hardening.
3. Face of solid bronze worm gear is extra wide to assure extra load carrying capacity. The heavy web and long hub prevent distortion when pressed on the shaft.
4. Perfect alignment of worm and gear is maintained by Gurney radial thrust bearings on worm shaft and Timken Bearings on gear shaft.

Bulletin 311 Gives Complete Data for Selecting Units. Write for it.

THE HORSBURGH & SCOTT CO.
CLEVELAND, U. S. A.

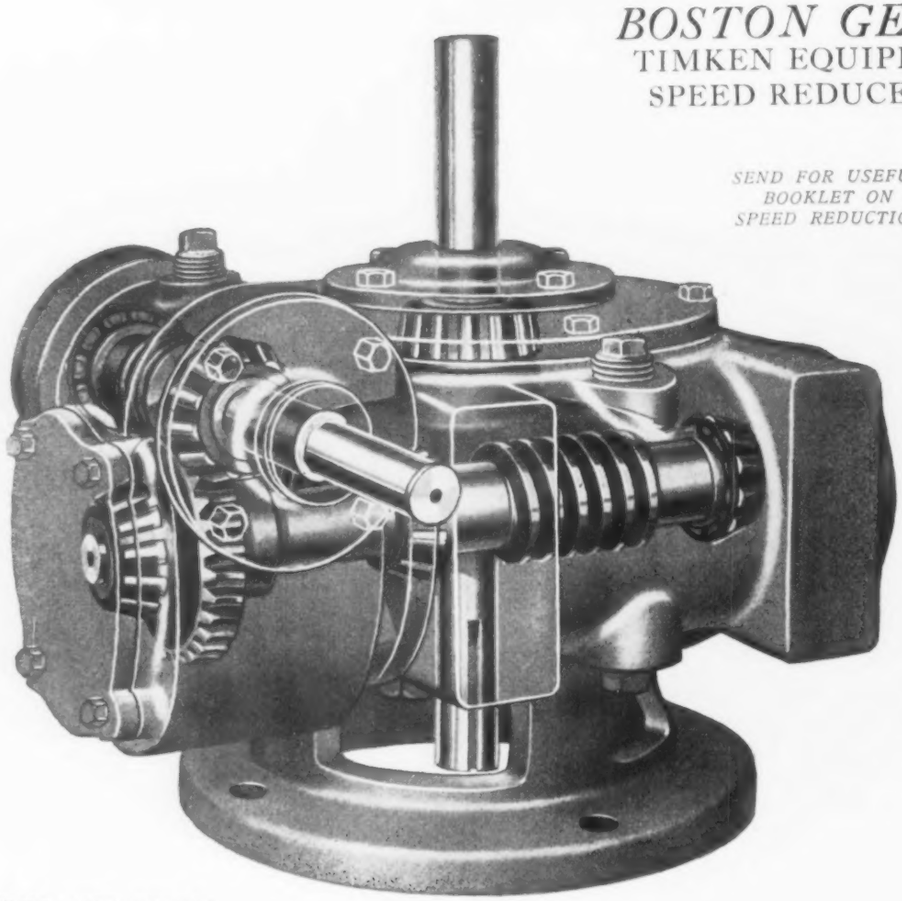
SPEED REDUCERS AND GEARS

STANDARDIZATION PAYS

for **SMOOTHER OPERATION**
and **LONGER SERVICE—**

BOSTON GEAR
TIMKEN EQUIPPED
SPEED REDUCERS

SEND FOR USEFUL BOOKLET ON SPEED REDUCTION

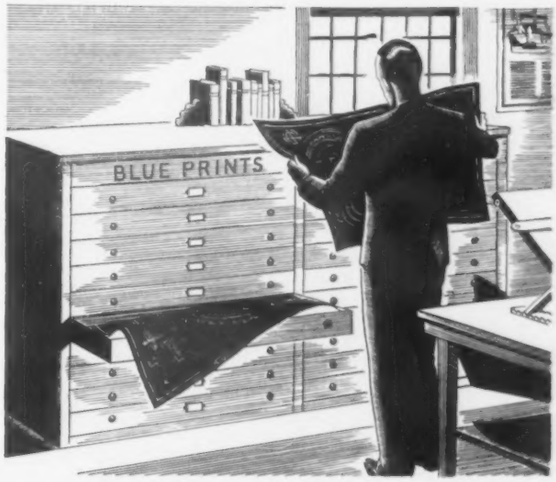


ALL TYPES AND SIZES
from stock!

BOSTON GEAR WORKS SALES CO. NORTH QUINCY, MASS.
BOSTON NEW YORK PHILADELPHIA CLEVELAND CHICAGO
SERVICE STATIONS FROM COAST TO COAST

BOSTON GEARS

• The Gear Department of many a smart manufacturer—



all in one cabinet

PRODUCTION costs are being cut. Demands on production efficiency are increasing. That is why the gear department of many a smart manufacturer is contained in one blueprint cabinet.

For a manufacturer often finds it more economical to turn over to us his problems of gear design and production. With the assistance of our experienced engineering staff, he is able to standardize on the one type best suited for each job.

Complete control of materials and modern production facilities enable us to furnish high quality, accurately cut, smooth running gears at a cost actually below his own manufacturing cost.

Perhaps *your* gear department could profitably be transferred to one blueprint cabinet. One of our representatives will be glad to call.

Companies Merged to form Gears & Forgings, Inc.
Van Dorn & Dutton Co.
William Ganschow Co.
Fawcus Machine Co.
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GEARS AND FORGINGS, INC.
General Offices: 3124 WOODHILL ROAD, CLEVELAND, OHIO, U. S. A.
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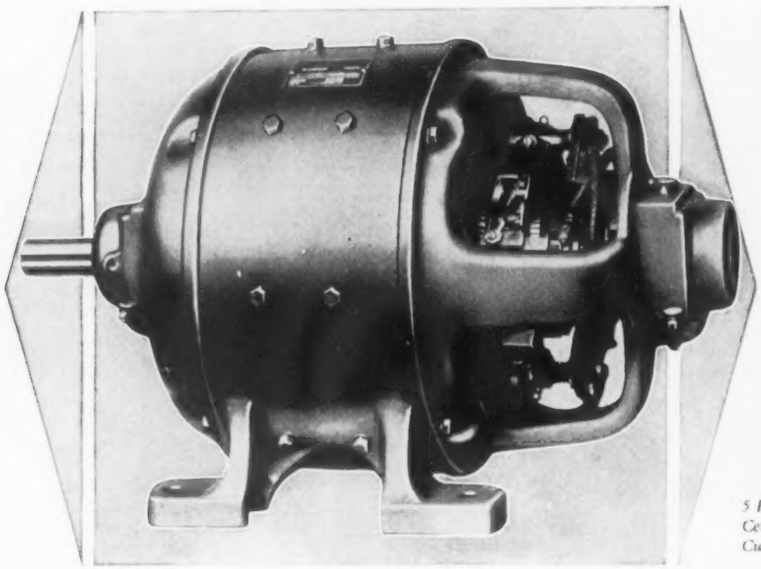
PRODUCTS

DROP, FLAT HAMMER AND UPSET FORGINGS . CUT GEARS . SPEED REDUCERS
ROLLING MILL MACHINERY . SPECIAL MACHINERY . BRIDGE OPERATING MECHANISMS

GEARS AND FORGINGS INC.

THEY KEEP A-RUNNING



5 Horse Power Century Direct-Current Motor

CENTURY
Constant Speed
DIRECT-CURRENT MOTORS

The service continuity of these Constant Speed Direct-Current Motors is the result of 37 years spent by the Roth works in perfecting D. C. Motors that "Keep a-Running" in all types of applications.

These motors are also supplied for variable or adjustable speed operation, for general purpose and special applications—with either shunt, compound or series windings for all commercial voltages—in open-type, drip-proof, semi-enclosed and fully-enclosed dust-tight construction.

Built in standard sizes from ¼ to 100 horse power.

CENTURY ELECTRIC COMPANY
1806 PINE STREET · · ST. LOUIS, MO.
40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS

Century MOTORS

MOTOR GENERATOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS

DC-29

FOR MORE THAN 27 YEARS AT ST. LOUIS

INCREASED PROFITS

ACME Forging Machines have long been noted for their accurate work, which eliminates rejects and increases profits.

Speed and freedom from interruptions during production are other important factors which contribute to their popularity.

Designed for heavy duty. Rugged and compact, they give efficient performances on all work ranging from rough forgings to work requiring .003" tolerance.

Built in ten different sizes from 3/4" to 5" capacities inclusive. Write for full details.

THE ACME MACHINERY CO.

COR. ST. CLAIR AND HAMILTON STS., CLEVELAND, OHIO

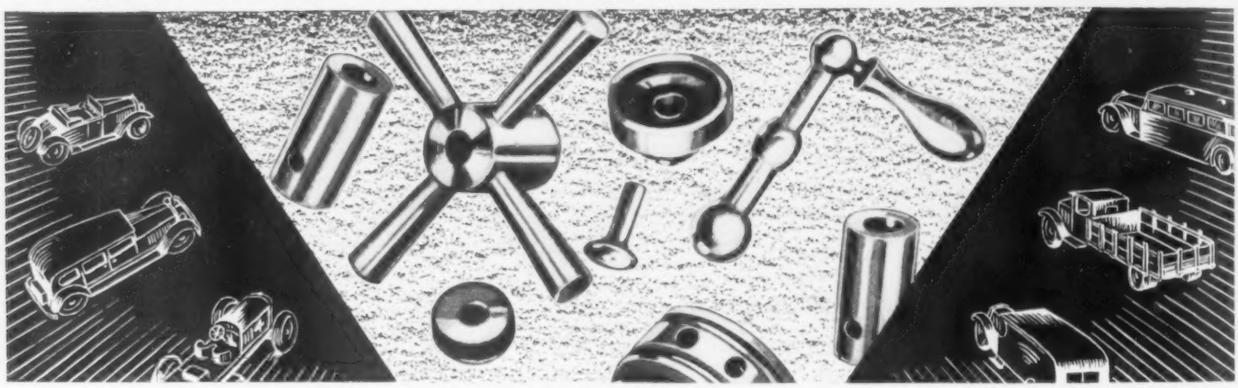
DETROIT OFFICE: 5185 LORAINE ST.

EUROPEAN AGENTS:

Burton, Griffiths & Co., London, England; Glaenzer & Perreaud, Paris, France; Ing. Ercole Vaghi, Milan, Italy; Henry W. Peabody & Co., Melbourne, Australia; Isbecque Todd & Co., Brussels, Belgium

A REAL HELP

IN THIS YEAR OF THRIFT



MANY manufacturers have been enabled to meet highly competitive sales conditions through the adoption of Carnegie Carbon Manganese Steels. Not only have their costs of manufacture been materially reduced, but the quality of their product has been improved as well.

Carnegie Carbon Manganese Steels are furnished, hot rolled, in a number of grades suitable for various purposes, and their excellent quality is the result of many years of manufacturing experience. To safeguard this quality, chemical analyses are made both during and subsequent to their manufacture. A grade for forging purposes responds to heat treatment in a manner similar to low nickel chromium steel. The grade for screw stock is a low carbon, high manganese, high sulphur steel, particularly suitable for automatic or other high speed cutting. Faster and smoother production and lower tool costs have been the common experience of its users. Suitable heat treating and case hardening develop a fine grained, uniformly hard case and tough ductile core.

Many manufacturers of cold finished steels are using Carnegie Carbon Manganese Steels to supply their customers' requirements for high quality products. Make a comparative test with the steel you are now using.

CARNEGIE STEEL COMPANY
Subsidiary of United States Steel Corporation
PITTSBURGH, PA. 130

CARNEGIE
CARBON MANGANESE STEELS

When loaded cars are "loaded" dice

On every car of material that enters or leaves your plant, you gamble with profits—*unless your scales are accurate.* Inaccurate weighing equipment throws the odds against you. You lose just as surely as you would with "loaded" dice.

A recent government survey shows that one-third of industrially owned track scales are inaccurate. The *majority* of these scales weigh *light.* Customary "trade practices" in weighing do not protect against such inaccuracies. Scale error must be figured *in addition* to such allowances. In view of these facts isn't it advisable to protect yourself by replacing obsolete, inaccurate scales with dependable equipment capable of handling modern, heavy cars?

Hundreds of industrial plant executives have turned to the Fairbanks Type "S" Track Scale as the permanent solution to their weighing requirements. Type "S" Scales are *designed* to withstand the severe strains imposed by heavy rolling stock. They can be relied upon to protect profits. Type "S" Track Scales are an important factor in the trend toward industrially owned scales. Their price is moderate and they actually pay for themselves over a period of time.

Interesting literature will be sent promptly upon request or a Fairbanks engineer will present the story at your convenience. There is no obligation.

FAIRBANKS, MORSE & CO., 900 S. Wabash Ave., Chicago

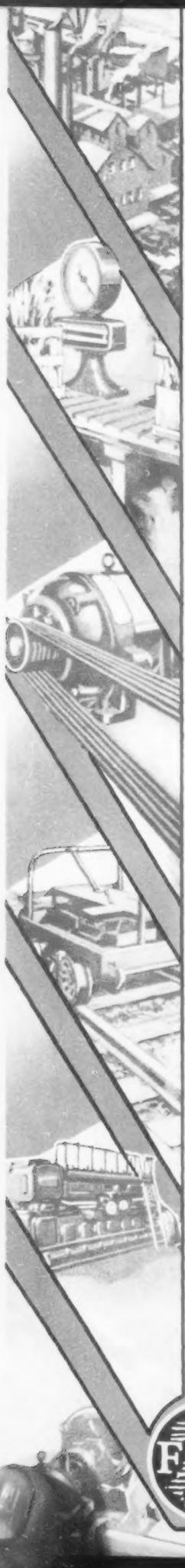
And 40 principal cities—a service station at each house

Fairbanks Heavy Capacity Type "S" Two-Section Track Scale. Notice the absence of dead rails.

FAIRBANKS SCALES

Preferred the World Over

POWER, PUMPING AND WEIGHING EQUIPMENT



F-M Synchronous Motor

increases power factor 14 per cent

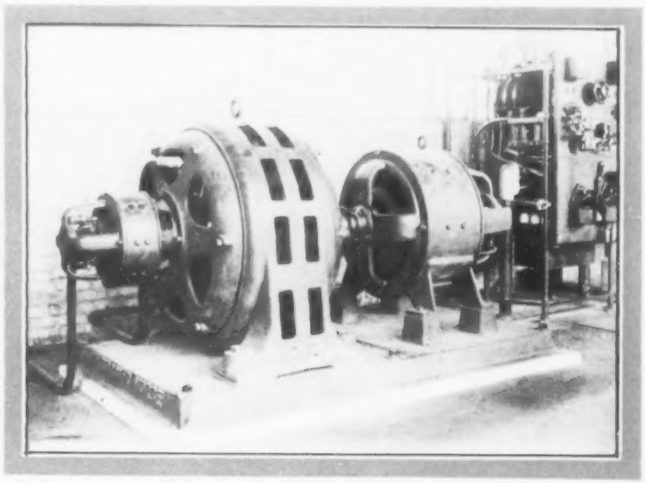
in Milwaukee plant . . .

A TYPICAL example of how Fairbanks-Morse Synchronous Motors are being used to increase the power factor in plants where additions to equipment have added to the induction load is provided by the installation of the Crucible Steel Castings Company at Milwaukee.

In this plant additional direct-current capacity was made necessary by the addition of a traveling crane. An F-M survey indicated that a substantial saving could be made by using a 150 hp. Fairbanks-Morse Synchronous Motor direct connected to a 100 kw. generator. The F-M Synchronous motor-generator set was installed and, as a result, the power factor of the plant was increased from 77 to 91 per cent. The savings attributable to this motor are sufficient to pay for the installation in approximately sixteen months.

Even where no premium is placed on high power factor by power companies it is advantageous to keep electrical load in the best balance possible. Where premiums are paid, a plant survey is most advisable as generally such a survey shows that synchronous motors installed at advantageous points will greatly improve the power factor and result in substantial savings.

150 hp. F-M Synchronous Motor direct connected to 100 kw. generator in the plant of the Crucible Steel Castings Co.



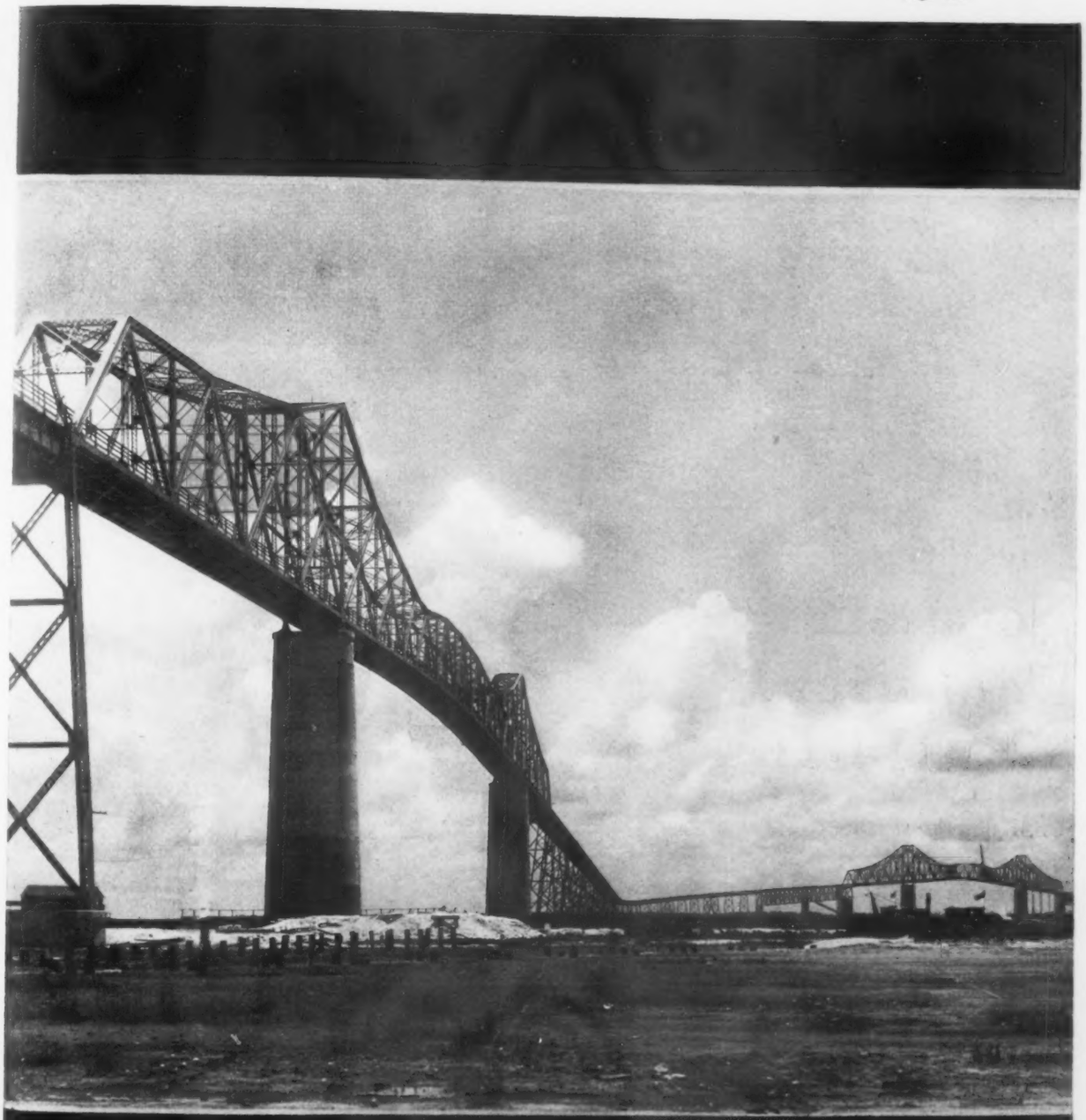
Let us send you complete information about F-M Synchronous Motors. See how Fairbanks-Morse advancements in design and construction have freed this type of motor from the limitations that previously narrowed their field. Built in high- and low-speed models to meet a wide range of applications. An F-M survey of your plant will be made without obligation to you.

FAIRBANKS, MORSE & CO.
900 S. Wabash Ave., Chicago
32 branches at your service throughout the United States

ESA40.10

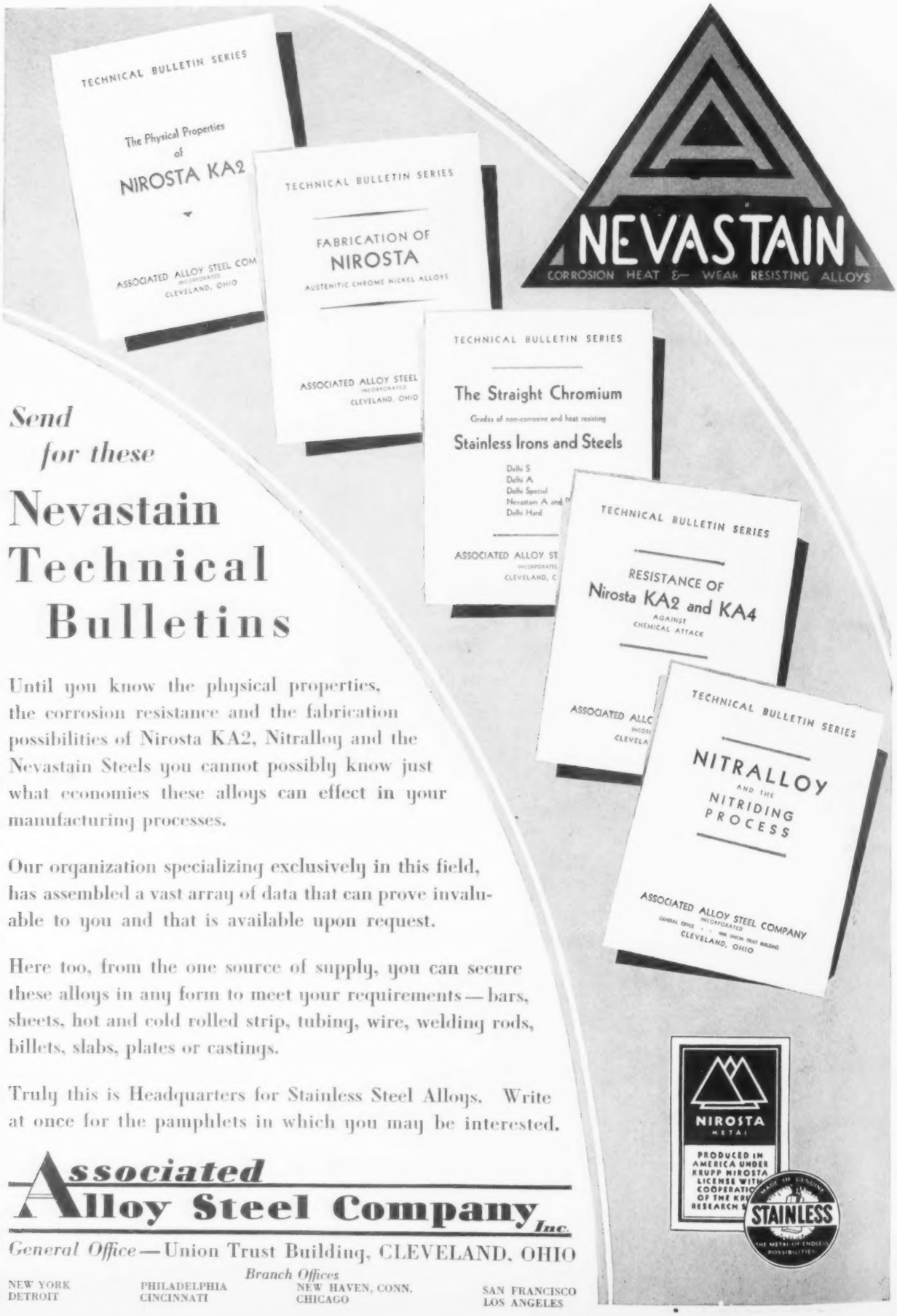
FAIRBANKS-MORSE
MOTORS

POWER, PUMPING AND WEIGHING EQUIPMENT



COOPER RIVER BRIDGE
Charleston, S. C.
Total length over two miles
11,500 TONS OF STEEL
Built by
McClintic-Marshall
Subsidiary of Bethlehem Steel Corporation

DESIGN BY WADDELL AND HARDESTY, CONSULTING ENGINEERS



Send for these

Nevastain Technical Bulletins

Until you know the physical properties, the corrosion resistance and the fabrication possibilities of Nirosta KA2, Nitralloy and the Nevastain Steels you cannot possibly know just what economies these alloys can effect in your manufacturing processes.

Our organization specializing exclusively in this field, has assembled a vast array of data that can prove invaluable to you and that is available upon request.

Here too, from the one source of supply, you can secure these alloys in any form to meet your requirements — bars, sheets, hot and cold rolled strip, tubing, wire, welding rods, billets, slabs, plates or castings.

Truly this is Headquarters for Stainless Steel Alloys. Write at once for the pamphlets in which you may be interested.

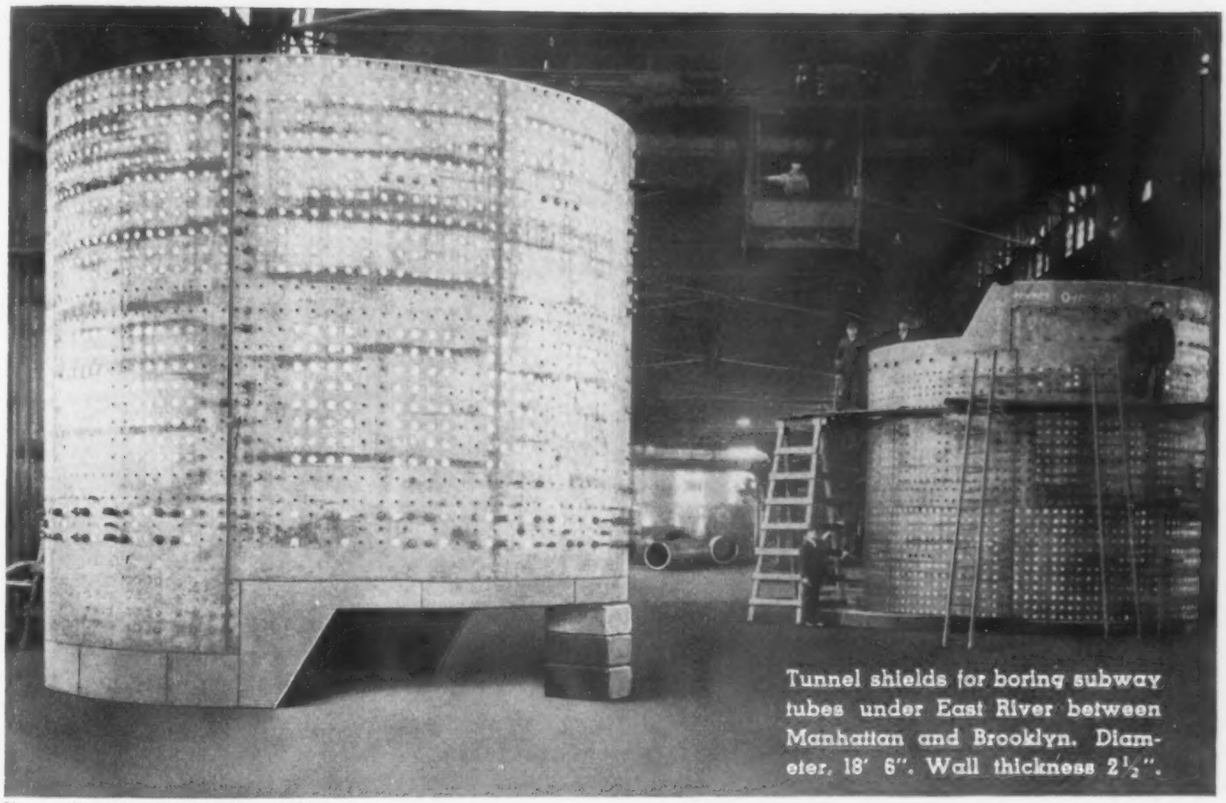
Associated Alloy Steel Company, Inc.

General Office — Union Trust Building, CLEVELAND, OHIO

Branch Offices

NEW YORK
DETROIT
PHILADELPHIA
CINCINNATI
NEW HAVEN, CONN.
CHICAGO
SAN FRANCISCO
LOS ANGELES

A MAN'S SIZED JOB
—delivery ahead of schedule



Tunnel shields for boring subway tubes under East River between Manhattan and Brooklyn. Diameter, 18' 6". Wall thickness 2½".

Photographic study in the plant at Dunkirk, N. Y.

ALCO
STEEL PLATE WORK

Bubble Towers Stills
Scrubbers Digesters
Creosoting Cylinders
Impregnators
Mixing Kettles
Large Diameter Steel Pipe
Autoclaves Vulcanizers
Special Vessels
Pressure Tanks

DELIVERY ahead of schedule of the eight giant tunnel shields for boring the twin tubes of the new city-owned subway line under East River between Manhattan and Brooklyn—excavation for which recently began—was characteristic of Alco efficiency. Co-ordinated with the great manufacturing facilities of the American Locomotive Company, Alco Products, Inc., is prepared to turn out the largest and most difficult jobs of fabricated steel plate work with ease and promptness.

ALCO PRODUCTS, INCORPORATED
220 East 42nd Street, New York, N. Y. · Plant at Dunkirk, N. Y. · Cable Address: Alproducts
DIVISION OF AMERICAN LOCOMOTIVE COMPANY

HIGH AND LOW CARBON

STRIP STEEL

HOT AND COLD ROLLED

-- in all tempers

The rapid growth and development of modern forming and stamping practice has widened the scope and created new demands for strip steel in many branches of industry.

Since 1897 we have specialized in high quality Hot and Cold Rolled Strip Steel, which constantly met the increasing requirements in this field.

A wide range of high and low carbon strip steel in all tempers—widths from ¾" to 24"—hot and cold rolled—coiled or cut to lengths that best suit your needs.

Also Bright Cold Rolled STAINLESS STEEL OF ALLEGHENY METAL and ASCOLOY grades. Excellent for drawing and forming. Resists corrosion. may be welded and soldered.

Save with Steel

HOT AND COLD ROLLED WLSCo STRIP STEEL

WEST LEECHBURG STEEL COMPANY

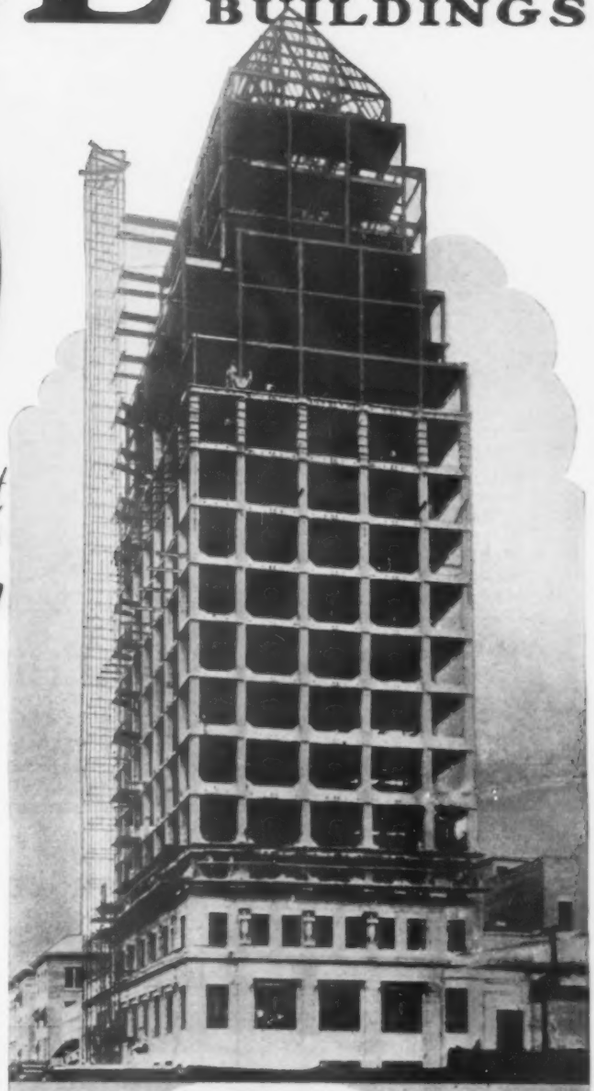
General Offices: FARMERS BANK BLDG., PITTSBURGH, PA.

BRANCH SALES OFFICES:

NEW YORK	CHICAGO	DETROIT
HARTFORD	CINCINNATI	ST. LOUIS
PHILADELPHIA Edgcomb Steel Co.	NEWARK Edgcomb Steel Corp.	TOLEDO Dean Higgins & Co.

Warehouse Stocks of Cold Rolled Strip Steel are Carried by
Edgcomb Steel Co., Philadelphia
Edgcomb Steel Corp., Newark
Jos. T. Ryerson & Son, Chicago

STEEL FOR BOATS BRIDGES OR BUILDINGS



Wherever there is a use for steel-Let TENNESSEE

figure on your requirements. Quality products backed by careful inspection—prompt shipments, with intelligent cooperation through understanding of the customer's needs—these are some of the reasons which make Tennessee a desirable source of supply.

Products: Structural Shapes, Plates, Bars and Small Shapes, Sheets (Blue Annealed, Black and Galvanized), Rails and Accessories, Forgings, Castings, Semi-Finished Products, Pig Iron.

US STEEL

Tennessee Coal, Iron & Railroad Co.

General Offices: Brown-Marx Bldg., BIRMINGHAM, ALA.

Subsidiary of United States Steel Corporation

The DEFIANCE No. 6

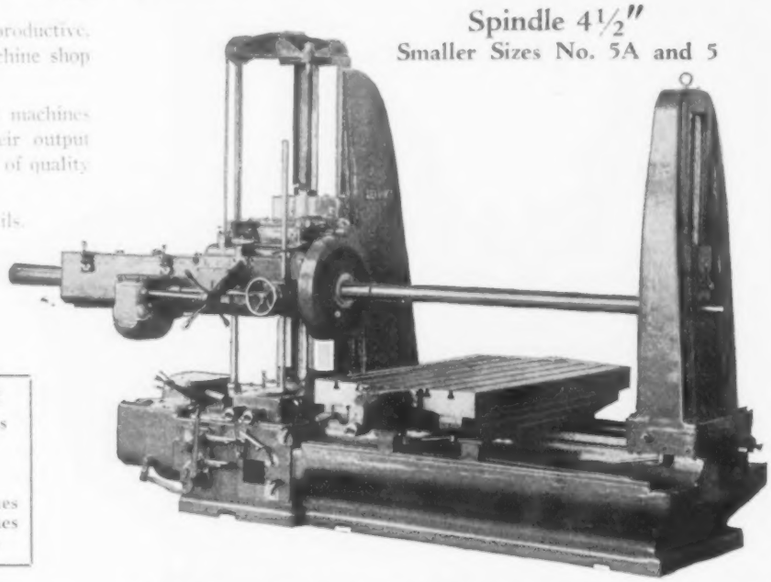
Boring, Milling, Drilling and Tapping Machine

Versatile, accurate, highly productive, the Defiance No. 6 is a machine shop in itself.

Those who are using these machines have increased not only their output but have set a new standard of quality and accuracy in their shops.

Let us give you further details.

Spindle 4½"
Smaller Sizes No. 5A and 5



THE DEFIANCE LINE
Cylinder Boring Machines
Heavy Service Drilling Machines
Rail Drills
Multiple Drilling Machines
Multiple Tapping Machines
Valve Grinding Machines

THE DEFIANCE MACHINE WORKS, Defiance, Ohio

Designers and Builders of Precision-Production Machine Tools

ESTABLISHED IN 1850

For Those Coarse Pitch Threads

THERE'S not a Self Opening Die Head made that's as rugged and sturdy as the Geometric Style D. That's the reason why this tool is so universally used on coarse pitch threads such as 4 U. S., Double Acme, Buttress, etc.

Big heavy chasers backed up by a heavy mass of metal are employed. Furthermore the chasers are positively cammed open and closed. It's an easy tool to operate and adjust for size, too. The quick removable chaser feature—take out chasers without removing plates or screws—much copied today, has been incorporated in this tool for over twenty-five years.

Write for the D Type Die Head Booklet. Get all the facts on these tools—the most widely used Die Heads in the world.

THE GEOMETRIC TOOL COMPANY

New Haven, Conn.

Also Manufacturers of Collapsing Taps, Solid Adjustable Taps and Threading Machines

ACME

Hot and Cold Rolled Strip
Nirosta Chrome Nickel Strip
Electro Galvanized Strip

....

Long Length Coils
or Cut-to-Length

ACME STEEL COMPANY

General Offices: 2832-40 Archer Avenue .. Chicago
BROOKLYN DETROIT MILWAUKEE SAN FRANCISCO

STEEL

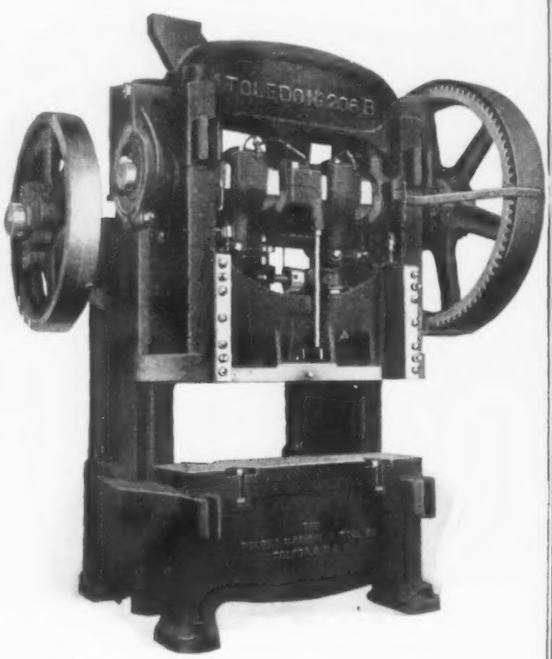
44

THE

"Toledo"

Overhanging or Gap

DOUBLE CRANK PRESSES



THESE presses are adaptable for a wide range of uses—multiple punching, shearing, blanking and forming on sheet or bar work, or operating perforating dies for automobile brake bands, linings, frame cross channels, tank and windmill frames, etc.

Built in over 200 sizes, weighing from 5,000 to 400,000 pounds.

PRESSES FOR EVERY PURPOSE

Over two thousand patterns from which to choose.

THE TOLEDO MACHINE & TOOL CO.

Engineers, Founders and Machinists on Equipment for Sheet Metal Products

TOLEDO, OHIO, U. S. A.

CHICAGO OFFICE
549 W. Washington Blvd.

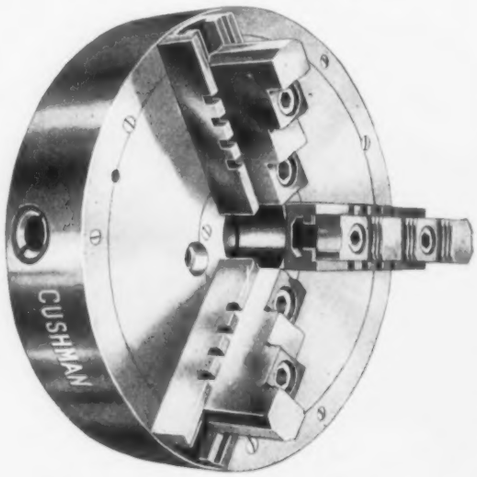
DETROIT OFFICE
3-258 General Motors Bldg.

"ITS OLD AND YET ITS NEW"

A CUSHMAN CHUCK

Made only as Cushman can make it

No. 30—The Air-Tight



Air-Tight — Water-Tight — Dust-Proof

It is hermetically sealed and packed with grease

5 Sizes from 12 to 27 in. diam.

Abrasive dust will eat the heart out of any chuck if it can get at it, but it has no chance to do it in an Air-Tight.

As a chuck to be used for the facing operations in the making of grinding wheels, the Air-Tight excels all other Chucks.

It can often be used continuously for several years without cleaning or repacking.

Grinding Machine Builders recommend an Air-Tight Chuck for some of their special-purpose machines. As for instance, those for grinding the finished bore from the pitch line.

The Air-Tight is a self-centering chuck with the geared scroll movement and is made in the same thorough way that all other Cushman S. C. Chucks are. It is as powerful and accurate as other Scroll Chucks of equal size.

For a further description, see Catalogue No. 47A

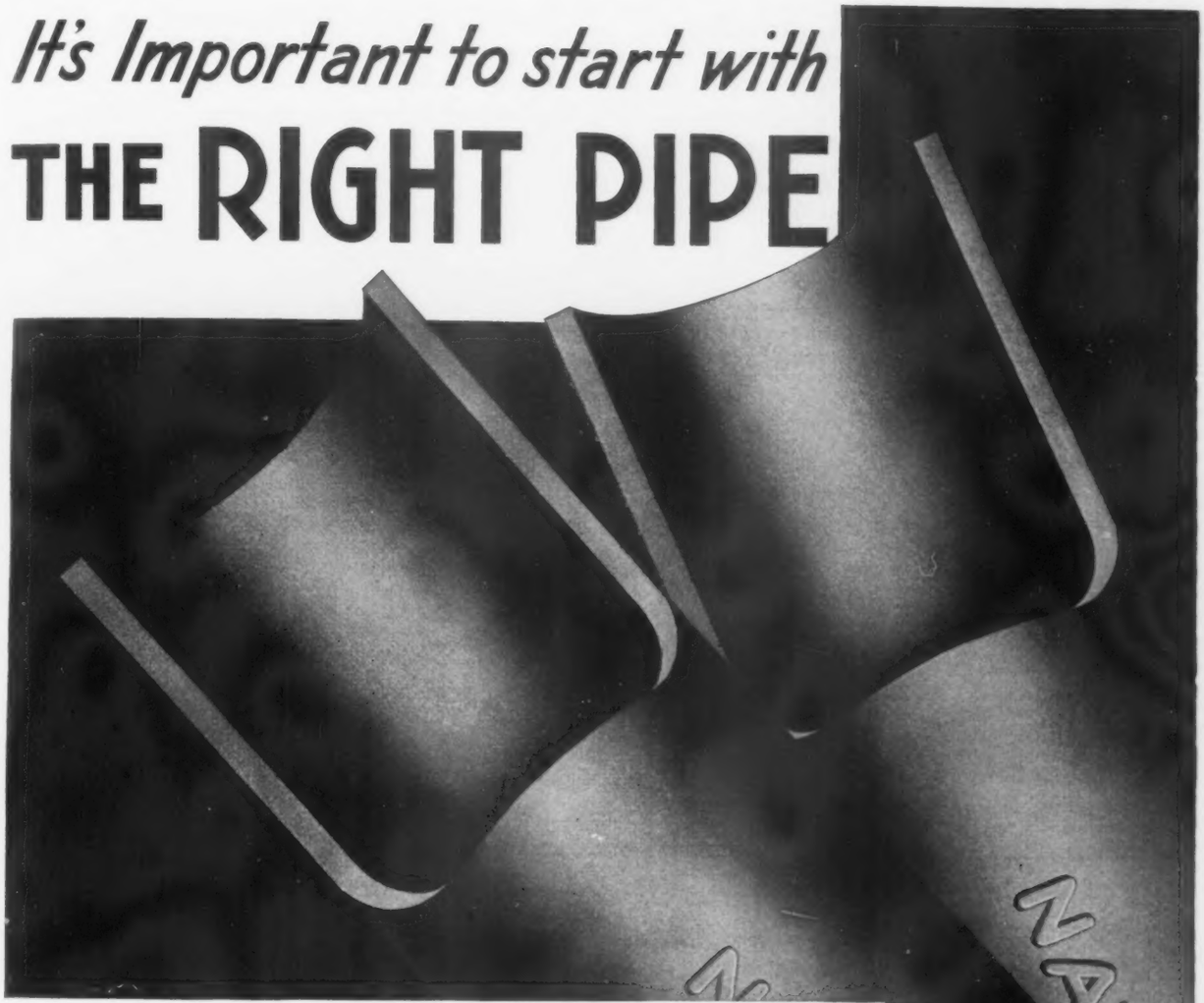
When reviewing the general machine tool equipment of your plant, Don't Forget The Chucks!

This is No. 4 of a series of advertisements.

The CUSHMAN CHUCK Co., HARTFORD, CONN., U.S.A.

"ASK CUSHMAN TO CHUCK IT"

It's Important to start with
THE RIGHT PIPE



The best of installation practice will not impart to a piping system qualities necessary for long life and satisfactory service. Durability must be in the structure of the pipe itself. And the more unfavorable the service conditions—the more important to start with the right pipe.

Under good or bad conditions, NATIONAL Scale Free Pipe promises long, satisfactory service, because of the improved methods by which it is made. Special rolling processes have removed the mill-scale, leaving a clean, smooth, dense, and uniform surface structure, with no foreign elements to set up electrolytic action, to cause the failure of galvanizing or other protective coatings, or to come off and interfere with proper flow.

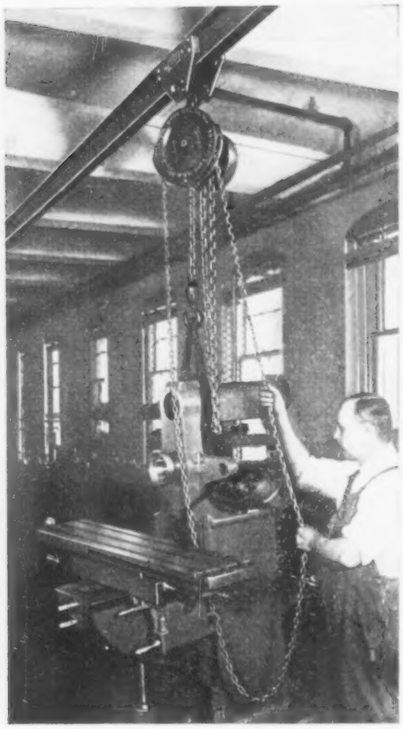
Just to look at NATIONAL Scale Free Pipe is to note a difference. This pipe is "all pipe"—there's no scale to cause any kind of trouble. And service records bear out the promise of its appearance—it is as good as it looks. You start right if you specify NATIONAL—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

UNION SPUR GEAR HOISTS *for Service*



Sizes ¼ to 20 Ton

We will replace FREE any part of a Union Spur Gear Hoist (except chain and hand wheel) for 5 years that proves defective or wears out in ordinary use.

EXCLUSIVE HOIST FEATURES

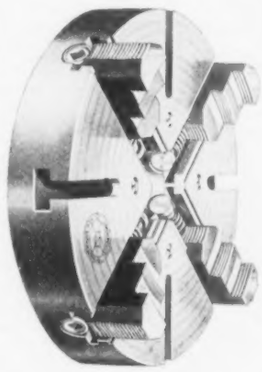
Reversible Load Sprocket (an exclusive feature) *Insures Double Service*

Large Roller Bearings
Solid Load Axle Alloy Steel Cut Alloy Steel Gears

Electrically Welded Proof Tested Chain
Hoist Tested to 50% Overload

ACCURACY and ENDURANCE

In Every Type of **UNION CHUCK**



SHOP FOREMEN know good chucks and specify UNION CHUCKS because they are modern.

Illustration shows a UNION All Steel Independent Chuck No. 264. Our records show that, after a quarter of a century of making this chuck, not one has broken in service, and besides it has oversize jaws and chrome nickel screws.

Use our engineering service.

Write for a Complete Catalog

UNION MANUFACTURING CO.
NEW BRITAIN **CONNECTICUT**

Branch Offices:
27 S. Jefferson St. Chicago, Ill.
332 Sycamore St. Cincinnati, Ohio
26 Cortlandt St. New York City, N. Y.
661 Folsom St. San Francisco, Cal.

If you have a production problem on which Hydraulic Pressure can be used

WATSON-STILLMAN

has a press that can be adapted to your work

Railroad Shops, Steel Plants, Metal Working Shops, Rubber Works, Paper, Pulp and Powder Mills, Chemical Plants and many other special industries have found Watson-Stillman equipment best suited to their work.

This Lead Press is Just an Example of Our Large Line

We build complete hydraulic plants including pipe, valves, pumps, accumulators, intensifiers, and presses, for every purpose such as:

Bending and Straightening
Die Sinking
Drawing
Embossing
Jacking
Metal Forming
Dehydrating
Thermo Plastic Molding
Powder, Carbon and Crayon Extruding
Metal Extruding
Baling
Sagger Molding and Clay Forming
Compressing and Assembling
Lead Covering Cable and Hose
Laboratory Uses
R. R. Shop Uses
Locomotive Spring Manufacture and Repair
Etc.

Write for Catalogs

THE WATSON-STILLMAN CO.

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6565 Russell St., Detroit
58 Fremont St., San Francisco
Union Natl. Bank Bldg., Houston
Widener Bldg., Philadelphia
409 E. Archer St., Tulsa
Forsyth Bldg., Atlanta
4511 Seminary Ave., Richmond
224 Pine St., Portland
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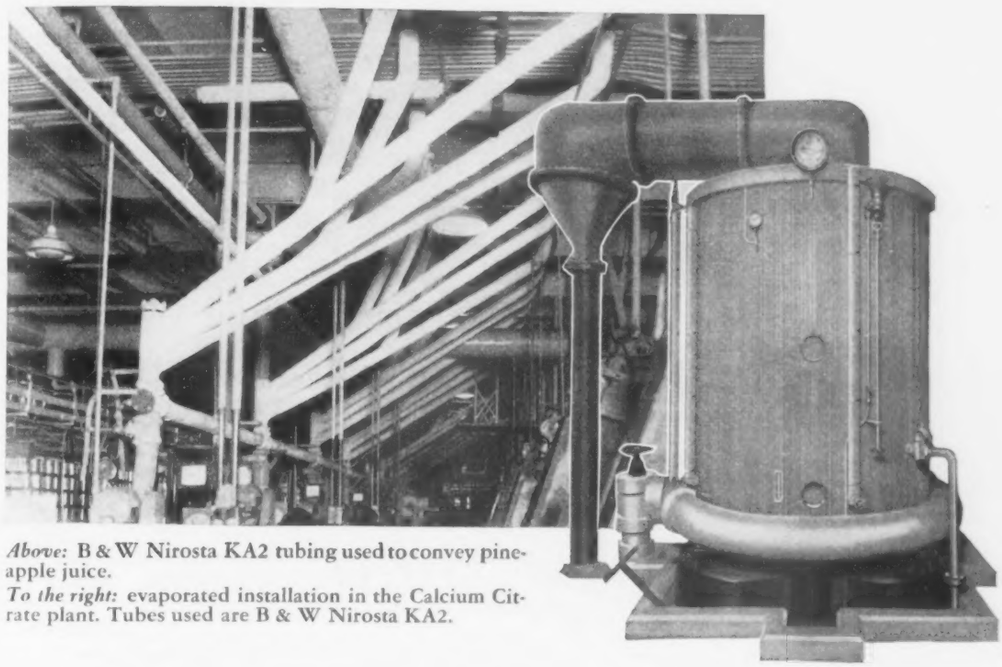
4th and Walcuta Sts., St. Paul

FOR CORROSION CONTROL

. . . the Food Industry Specifies

B & W Seamless NIROSTA KA2



Above: B & W Nirosta KA2 tubing used to convey pineapple juice.
To the right: evaporated installation in the Calcium Citrate plant. Tubes used are B & W Nirosta KA2.

NIROSTA METAL

FOR conveying fruit juices...and in numerous types of equipment used in processing food products . . . wherever fruit or food acids attack ordinary tube materials, the food industry is now specifying B & W Seamless NIROSTA KA2.

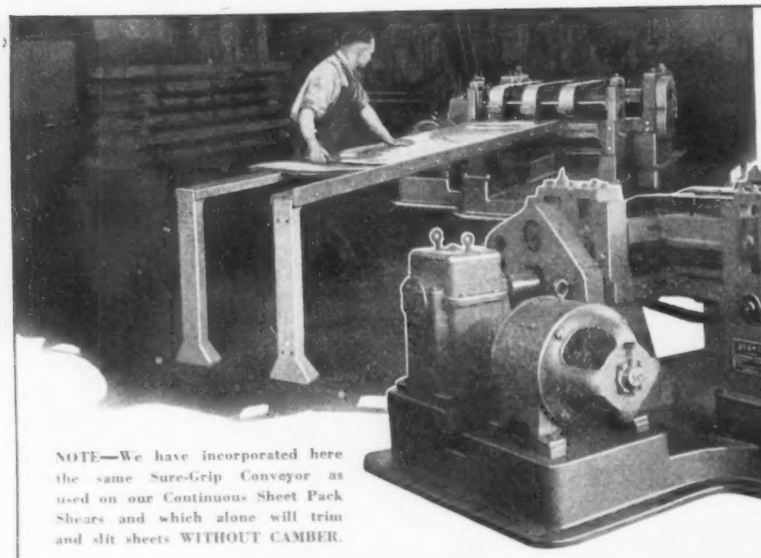
B & W Seamless NIROSTA KA2 tubing was selected for the installations shown, not only because of the superior corrosion resistance and other qualities of the metal itself, but because the long experience of B & W in the manufacture of special alloy tubing is an assurance of a high quality product and complete satisfaction in service.

A new booklet is available giving complete chemical, physical and other data relative to B & W Seamless NIROSTA KA2 tubing. If you have any tubular problem involving corrosion, ask for a copy today.

THE

BABCOCK & WILCOX TUBE COMPANY

BEAVER FALLS PENNSYLVANIA



"Stamco" Sheet & Plate Machinery

STRAIGHT & ROTARY SHEARS

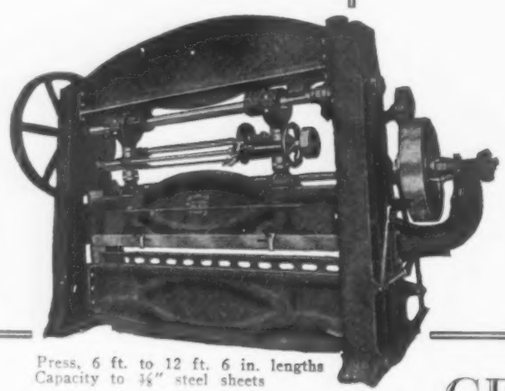
NOTE—We have incorporated here the same Sure-Grip Conveyor as used on our Continuous Sheet Pack Shears and which alone will trim and slit sheets WITHOUT CAMBER.

ALSO
Plate Shears
Sheet Shears
Strip Shears
Mill Shears
Factory Shears
Corrugating Machinery
Roofing Machinery
Culvert Machinery

Continuous Holddown Conveyor Rotary Slitter
(Patent Applied For)
Especially designed for trimming and slitting long sheets straight

The STREINE TOOL & MFG. CO.
NEW BREMEN, OHIO

HERE'S *What you can do on this OHL-10 Ft. Power Brake*



Press, 6 ft. to 12 ft. 6 in. lengths
Capacity to 3/8" steel sheets

—Bend a ten-foot sheet of No. 10 gauge steel—or, form skylight bars of No. 26 gauge steel in two operations. The seven members are bent in one operation and the bar squeezed together in the next.

This OHL Power Brake is equipped with a new method of holding dies, is amply proportioned, and heavily constructed, and includes a patented friction gear.

We'll be glad to go over this machine with you point for point and explain how economical—and simple—it is to operate.

GEORGE A. OHL & CO., Inc.
Originators of Sheet Metal Working Machinery Since 1863
151-161 Oraton St. Newark, N. J.

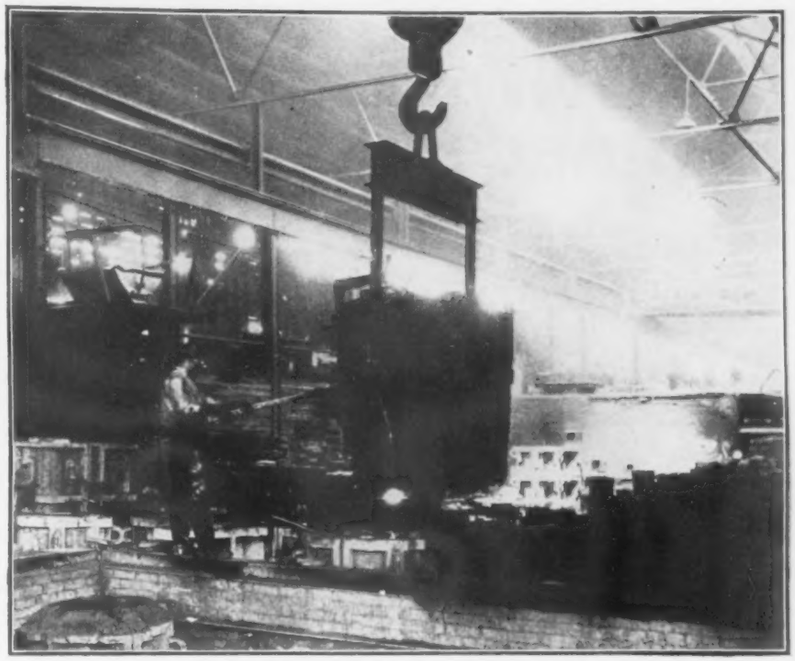
Crimping and Hammering Machines — Slitting Shears—Power Presses.

Double Cam Brakes—Slip Roll Formers—Squaring Shears—Mitre Cutters—

COUNTERACT HIGH SULPHUR

with

Zirconium



CHROMIUM
High-Carbon Ferrochrome
(maximum 6% carbon)
Low-Carbon Ferrochrome
(in grades, maximum 0.06%
to maximum 2.00% carbon)
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

▼

MANGANESE
Standard Ferromanganese
78 to 82%
Low-Carbon Ferromanganese
Medium-Carbon
Ferromanganese
Manganese Metal
Silico-Manganese
Manganese-Copper
Silico-Spiegel
Miscellaneous Manganese Alloys

▼

SILICON
Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 85%
Ferrosilicon 90 to 95%
Refined Silicon
(minimum 97% Silicon)
Calcium-Silicon
Calcium-Aluminum-Silicon
Calcium-Manganese-Silicon
Silicon-Copper
Silico-Manganese
Miscellaneous Silicon Alloys

▼

TUNGSTEN

▼

VANADIUM
All Grades

▼

ZIRCONIUM
Aluminum-Zirconium
Ferro-Zirconium
Silicon-Zirconium
Zirconium-Ferrosilicon

ORDINARILY the sulphur in soft steel castings is not high enough to do any harm, but in the production of acid resisting castings of high-chromium and nickel content a great many foundries include returned scrap carburizing boxes as a part of their charge. These boxes have absorbed sulphur which cannot be eliminated in acid-electric furnace practice. The use of Zirconium, preferably the grade known as silicon-zirconium, to counteract the effect of this sulphur has proven very useful.

Electromet Engineers will gladly help you demonstrate this and other advantages to be obtained through the proper use of Electromet Silicon-Zirconium and Zirconium-Ferrosilicon in your own plant.

Sole Distributors

ELECTRO METALLURGICAL SALES CORP.

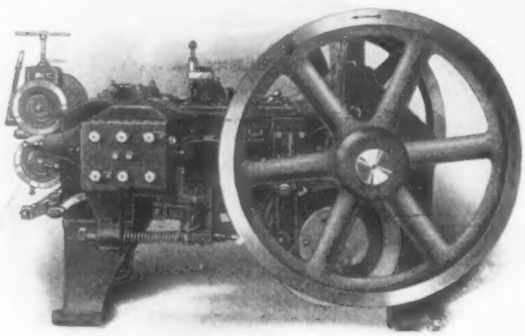
Unit of Union Carbide UCC *and Carbon Corporation*

Carbide and Carbon Building, 30 East 42nd Street
New York, N. Y.

Electromet
Ferro-Alloys & Metals

MANVILLE

PIONEER DESIGNERS AND BUILDERS OF DIRECT ACTING TWO BLOW CRANK HEADERS



MANVILLE No. 312 C D.S.O.D. Cold Header

Manville C-Model Double Stroke Open-Die Headers are designed and constructed to give the highest possible efficiency in the production of cold headed bolts.

Write for Bulletin No. 14C, illustrating and describing our High Speed Open-Die Headers

THE E. J. MANVILLE MACHINE CO.

HOME OFFICE AND WORKS: WATERBURY, CONN., U. S. A.

BRANCH OFFICES

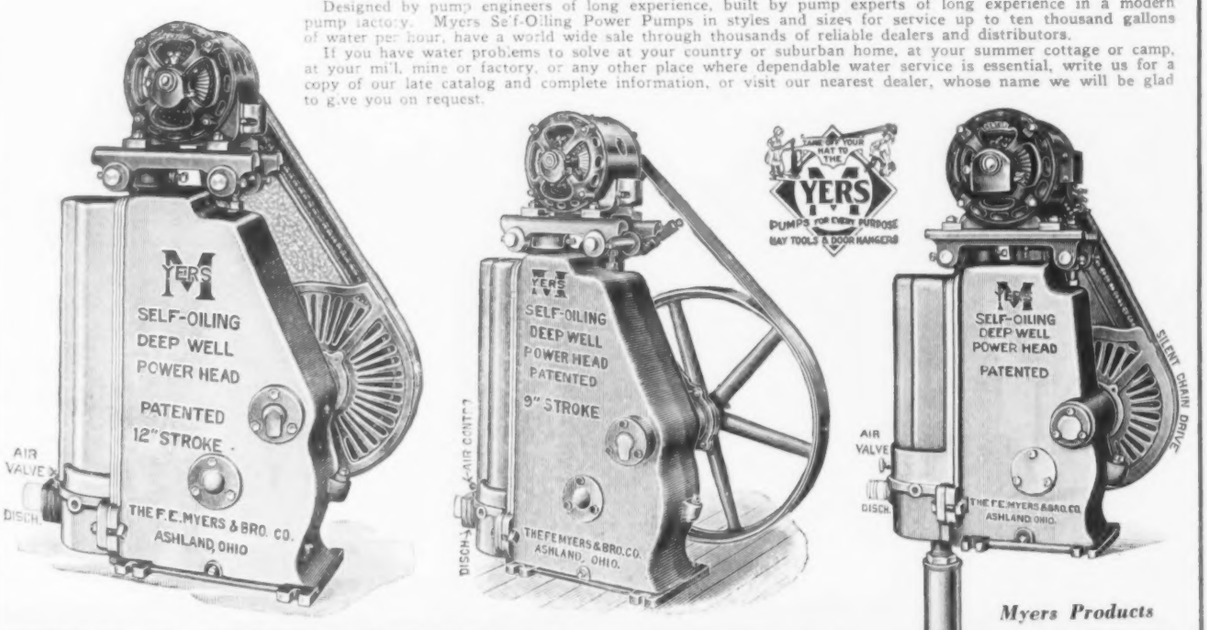
1209 Swetland Bldg., Cleveland, Ohio — 810 Stephenson Bldg., Detroit, Mich.

MYERS SELF-OILING POWER PUMPS

FOR GENERAL SERVICE

Designed by pump engineers of long experience, built by pump experts of long experience in a modern pump factory. Myers Self-Oiling Power Pumps in styles and sizes for service up to ten thousand gallons of water per hour, have a world wide sale through thousands of reliable dealers and distributors.

If you have water problems to solve at your country or suburban home, at your summer cottage or camp, at your mill, mine or factory, or any other place where dependable water service is essential, write us for a copy of our late catalog and complete information, or visit our nearest dealer, whose name we will be glad to give you on request.

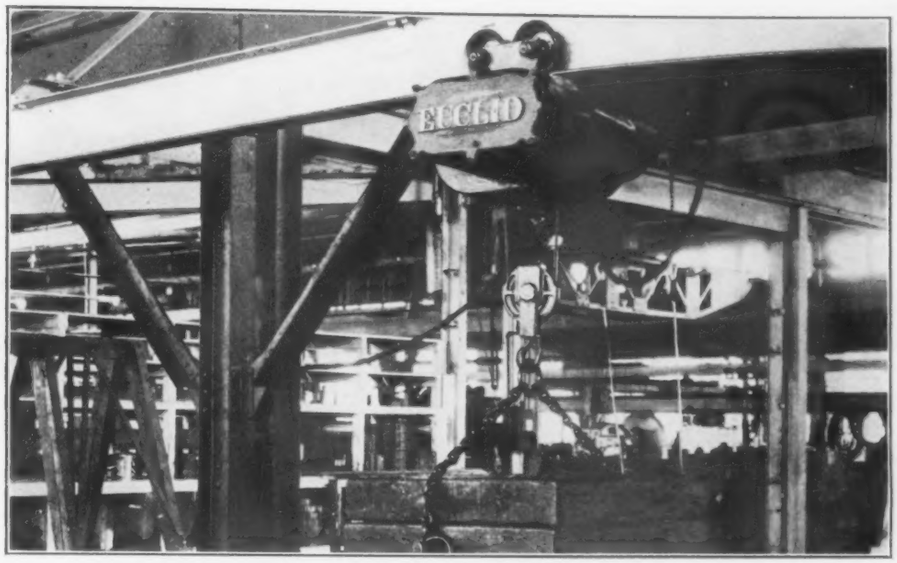


THE F. E. MYERS & BRO. CO., Ashland, Ohio

ASHLAND PUMP AND HAY TOOL WORKS

Myers Products

PUMPS, WATER SYSTEMS, HAY TOOLS, DOOR HANGERS



Hyatt Roller Bearings on every shaft in the new electric hoist built by The Euclid Crain and Hoist Co., Euclid, Ohio. Another of the several makes of hoists which regularly include Hyatt protection.

Upkeep tells its story of operating satisfaction

Profit or loss . . . efficiency or trouble? Out of the figures of operating costs comes the true story of bearing performance.

Usually, excessive labor, maintenance, repair costs mean unsatisfactory equipment, interruptions, delays, power loss, profit loss . . . faulty bearings! On the other hand, flawless equipment, faultless running, power saving and profit saving are the direct reflection of good bearings, like Hyatts.

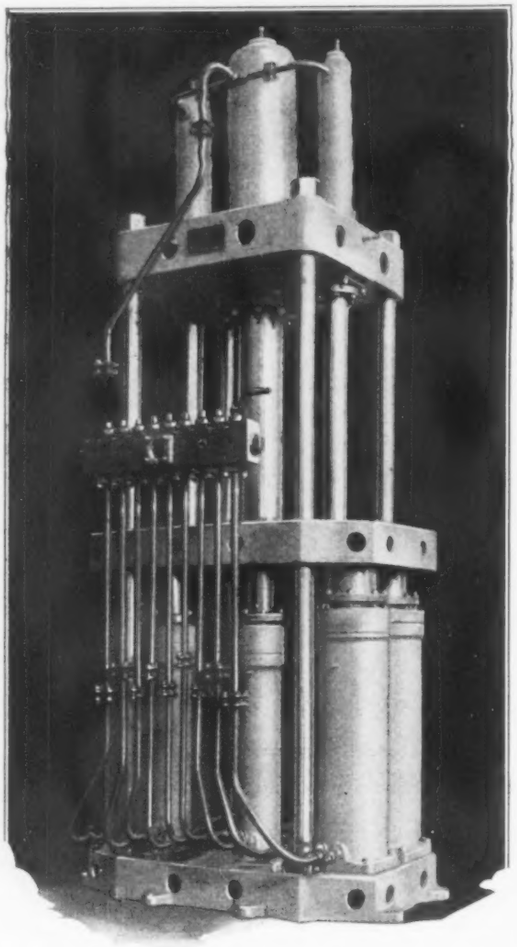
Everywhere Hyatt bearings are reducing upkeep . . . protecting and prolonging equipment life . . . increasing output to a very appreciable extent.

While saving, they serve in many ways . . . guarding against breakdowns and delays . . . standing up under severe operating conditions without adjustment or attention for long periods . . . reducing lubricant and lubrication.

This matter of upkeep is important. From whatever angle you consider bearings . . . long life . . . efficiency . . . economy . . . upkeep tells its story. Look into the saving way of Hyatt Roller Bearings. Hyatt Roller Bearing Company, Newark, Detroit, Chicago, Pittsburgh, Oakland.

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

Twelve-Pressure HYDRAULIC INTENSIFIER



RECENTLY we built two of these special machines of our design which are used in connection with tube testing equipment.

They raise the available line pressure of 800 pounds to 3000 pounds per square inch in steps of 250 pounds each. The intensifier rams are so located that the load on the cross head carrying the high pressure ram is always absolutely balanced. The manifold, with its built-in stop valves, provides for convenient operation in regulating the intensifier to the required pressure.

R. D. WOOD & COMPANY

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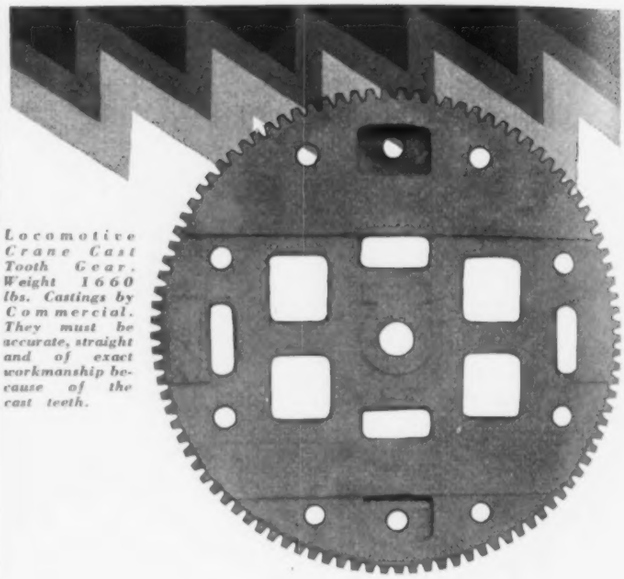
COMMERCIAL STEEL CASTINGS



Locomotive Crane Cast Tooth Gear. Weight 1660 lbs. Castings by Commercial. They must be accurate, straight and of exact workmanship because of the cast teeth.

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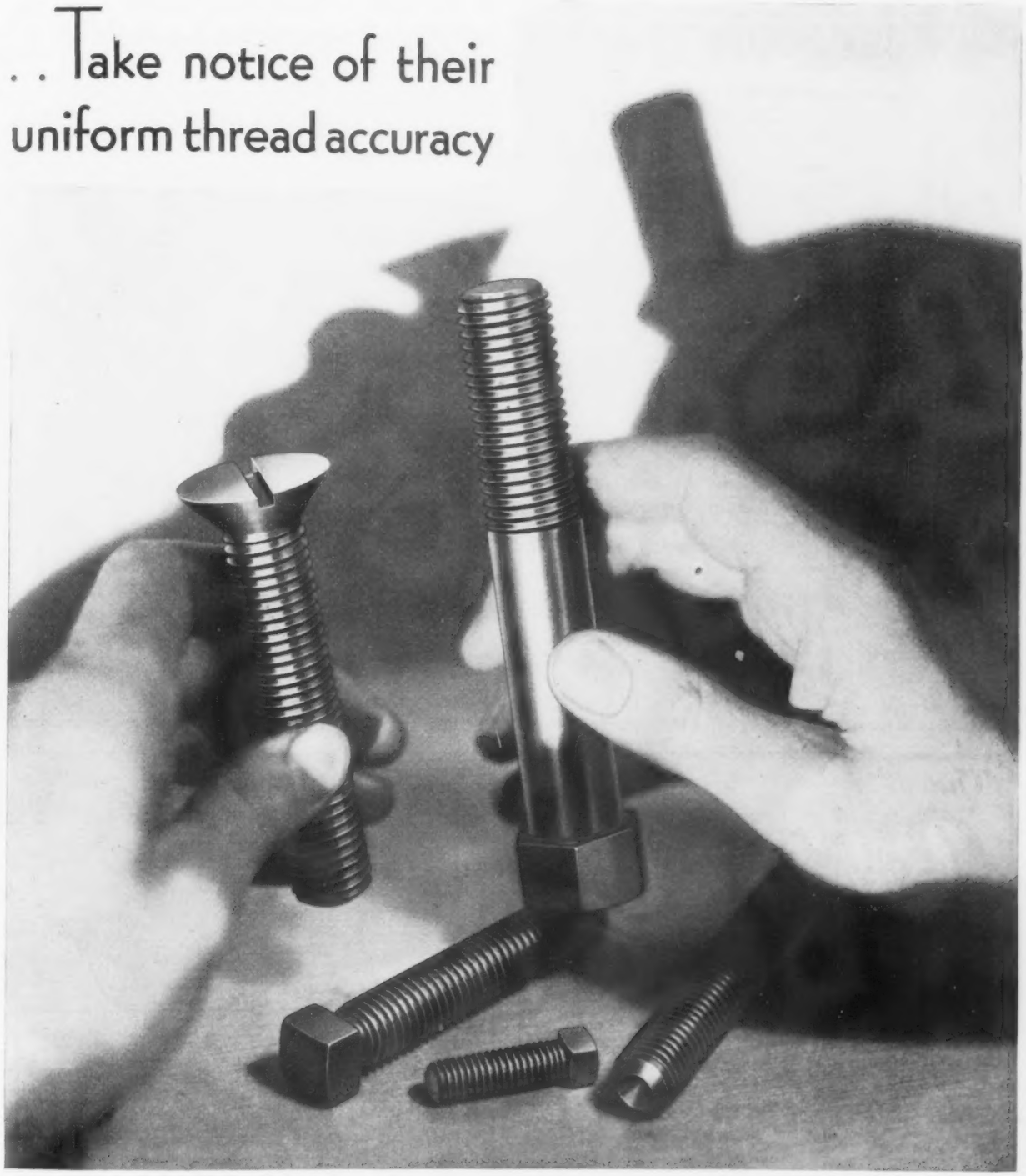
The feeling of satisfaction that is the result of a job well done is appreciated to the "nth" degree by Commercial in the service it renders to customers. Commercial's growth over a period of 12 years indicates its ability to please the several hundred successful manufacturers that have placed their faith in Commercial Castings to share in the responsibility of constructing a quality product. Better castings, better workmen, and proven materials combine to guarantee the highest attainment in casting construction. Let Commercial study your casting requirements.

Producers of Better Steel Castings.

THE COMMERCIAL STEEL CASTINGS CO.
MARION, OHIO

. . Take notice of their uniform thread accuracy



A CAP SCREW made by the Kaufman Method, *patented,* has no counterpart among ordinary commercial cap screws. You do not need a micro-photograph to demonstrate why. In Cleveland Cap Screws the smoothness of the thread is discernible in the fit in the tapped hole . . . and in the accurate fit of the nut. Such accuracy speeds up assemblies. It took many years to perfect the Kaufman Method, but the effort we made has produced a superior cap screw, a better cap screw than we ever made before. It might pay you to use a better cap screw.

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271 of 100 Tons Capacity and over

LADLE AND STANDARD CRANES

59		100 tons
2	WORM DRIVEN Ladle..	100 tons
2		115 tons
6	WORM DRIVEN Ladle..	125 tons
45		125 tons
30		150 tons
3	WORM DRIVEN Ladle..	150 tons
6	WORM DRIVEN Ladle..	160 tons
2	WORM DRIVEN Ladle..	165 tons
4	WORM DRIVEN Ladle..	175 tons
27		175 tons
3	WORM DRIVEN Ladle..	200 tons
4		200 tons
5		225 tons
1		250 tons
3	WORM DRIVEN Ladle..	250 tons
3	WORM DRIVEN Ladle..	275 tons
1		275 tons
1		300 tons
3		430 tons

STRIPPING CRANES

8		100 tons
1		125 tons
21		150 tons
19		200 tons
1	Single Ram,	320 tons

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3		100 tons
1		125 tons
3		150 tons
4		200 tons

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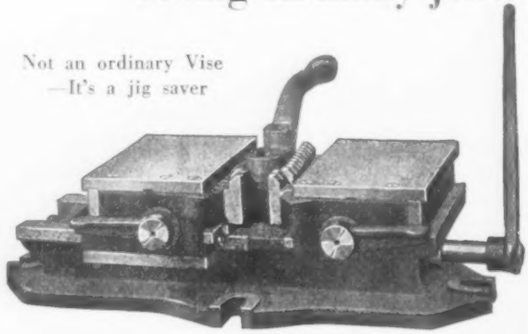

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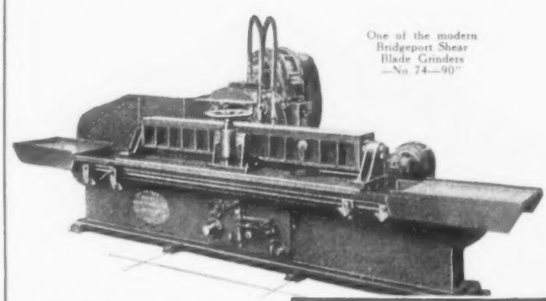
Cincinnati, Ohio



One of the modern Bridgeport Shear Blade Grinders —No. 74—90"

Minutes take the place of Hours with this modern
HYDRAULIC GRINDER

A shear blade ground on a Bridgeport Hydraulic Grinder.

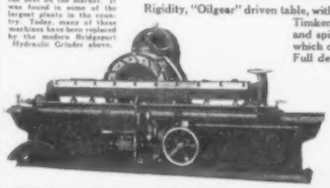
An Old Timer

Not many years ago, the old Bridgeport Knife Grinder, shown below, was one of the best on the market. It was found in some of the largest plants in the country. Today, many of these machines have been replaced by the modern Bridgeport Hydraulic Grinder above.

With the new, fast Bridgeport Hydraulic Shear Blade Grinder, jobs which would have required hours on older type machines are turned out in a few minutes.

Accuracy which could only be approximated on the old grinders is obtained on the modern machines to a remarkably close degree.

Rigidity, "Oilgear" driven table, with its wide speed range of from 3' to 85 F.P.M., Timken equipped wheel spindle, centralized control and spindle brake are only a few of the many features which contribute toward economy, speed and accuracy. Full details on request.



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Floor Grinders, Tool Grinders, Knife Grinders, Shear Blade Grinders, Face Grinders, Swing Frame Grinders, Radial Grinders, Wet and Dry Grinders, Slitter and Disc Grinders, Buffing and Polishing Lathes—and many special grinders. Also high grade Grinding Wheels (including the famous Bridgeport Sectional Wheels) to meet varied needs.

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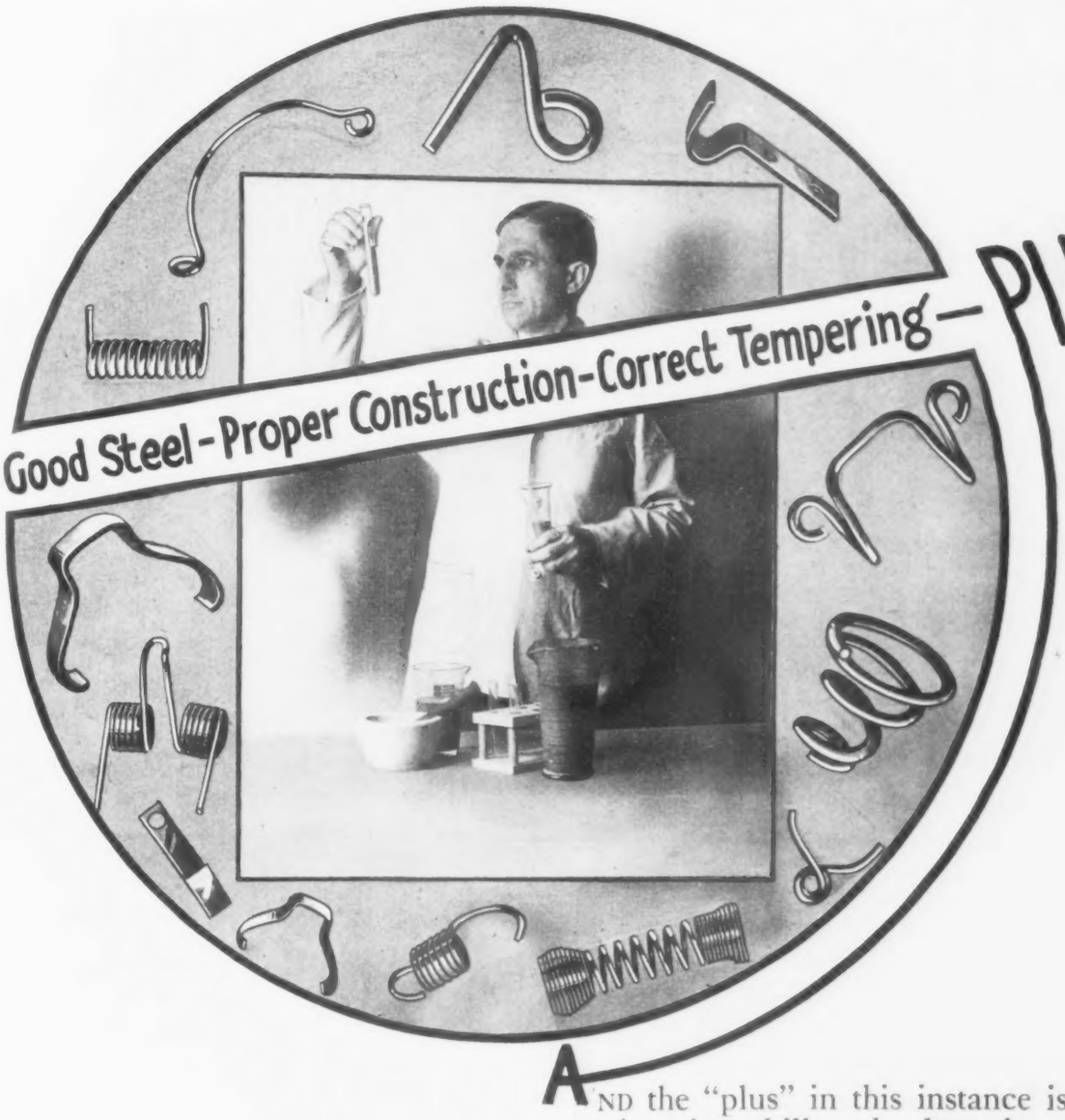

AND the "plus" in this instance is the engineering skill and talent that only a truly competent organization with years of experience can offer you.

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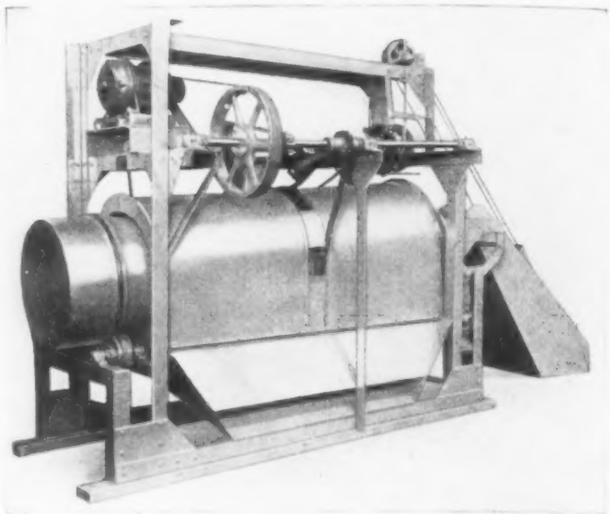
Separating sand from annealed castings quickly and automatically saves time and labor. Doing it thoroughly, saves money on tumbling operations.

The annealing pot is dumped into the power loader of this Ideal Casting Shake-Out Screen and discharges directly into the cylinder, which rotates at about 50 r.p.m. The sand is shaken out and falls to the bottom of the hood, down the chute, delivering at the side of the machine as shown. The rapidity with which the work passes through the revolving cylinder effectively removes all the surplus sand. This prevents excessive sand being carried into the tumbling barrels in the next operation. The process produces a cleaner casting and cuts down the tumbling time.



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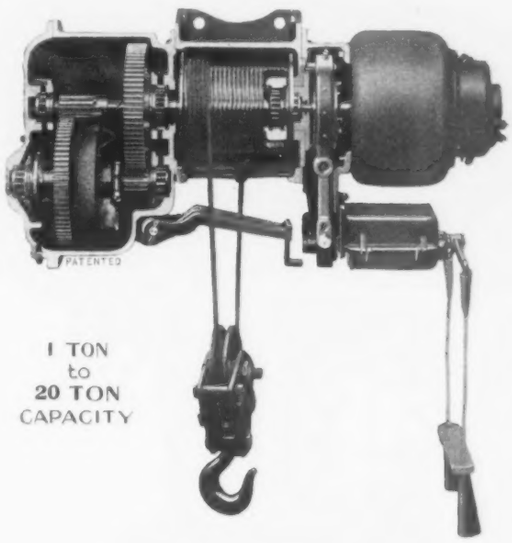
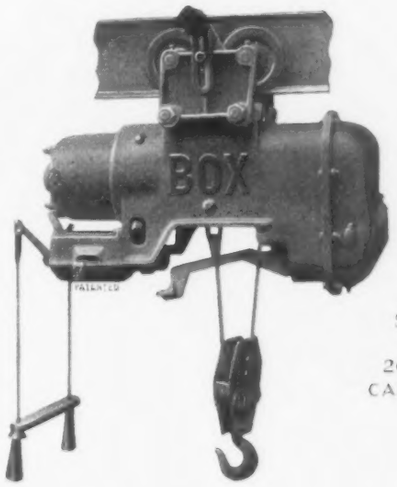


1 TON
to
20 TON
CAPACITY



500 lb.
to
2000 lb.
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MADE IN EVERY SIZE AND TYPE FOR EVERY DUTY

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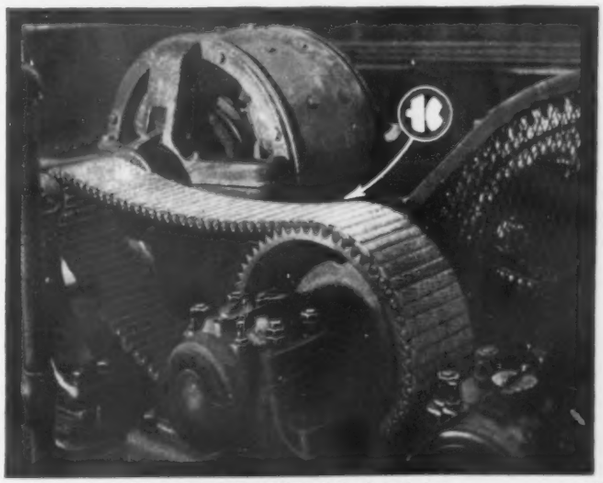

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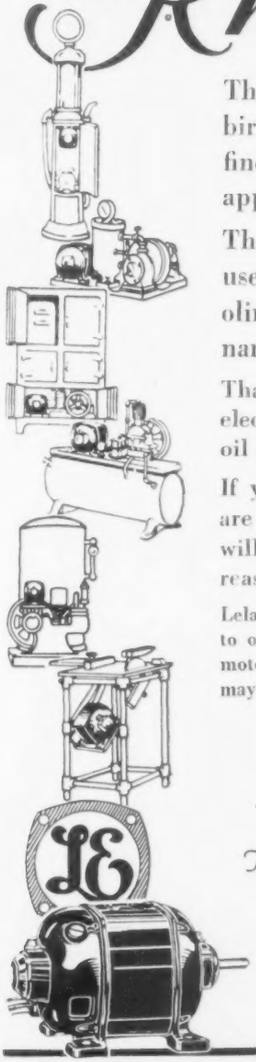

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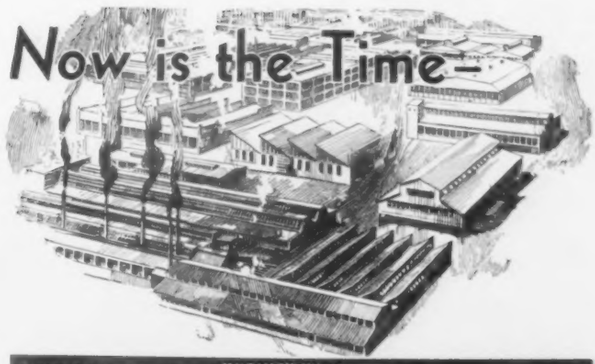

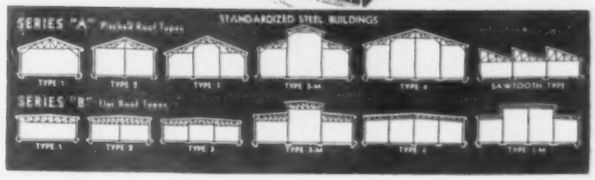

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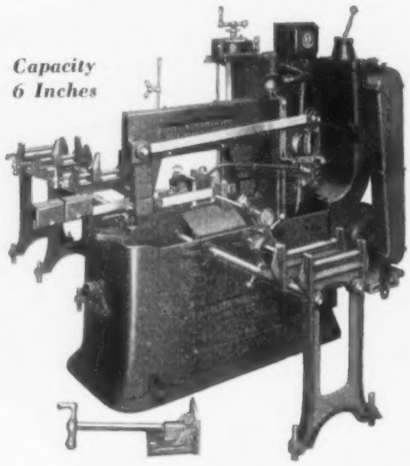

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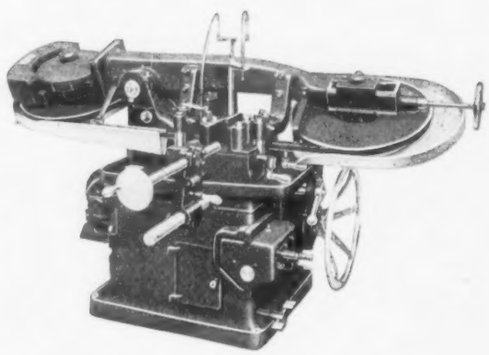

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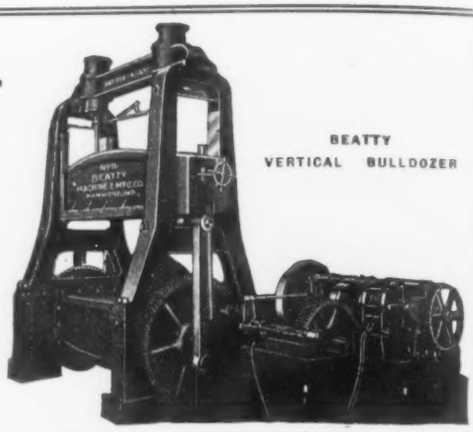
This Beatty Machine gives the greatest possible clear working space, with ample die-room for two or more set-ups. All parts are well proportioned to give strength and rigidity. The ram is counterbalanced, and the double friction clutch gives an immediate stop and reversal at any point.

Write for our new literature covering complete line of Vertical Bulldozers



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HEATPROOF Compression Riveter DIES

These dies are made from our special heat-proof, heat-resisting steel.

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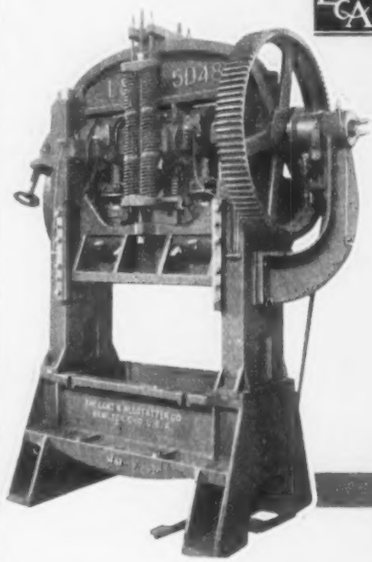

Single geared with direct motor drive through gearing with silent motor pinion. Self-adjusting brake. Clutch made of .75 carbon steel—four striking surfaces.

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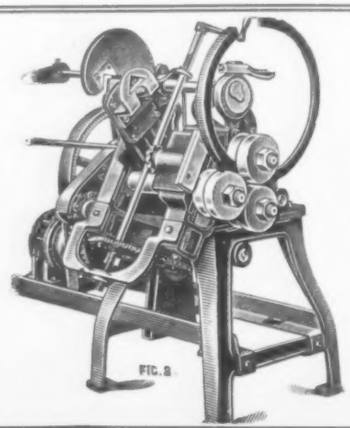

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Capacity up to 2 in. Angle Iron 10 in. to 10 ft. circles
With or without cut-off attachment; belt or motor driven.

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We are designing a Machine to bend into circles, U or S shape, 4" x 4" angle iron or under.
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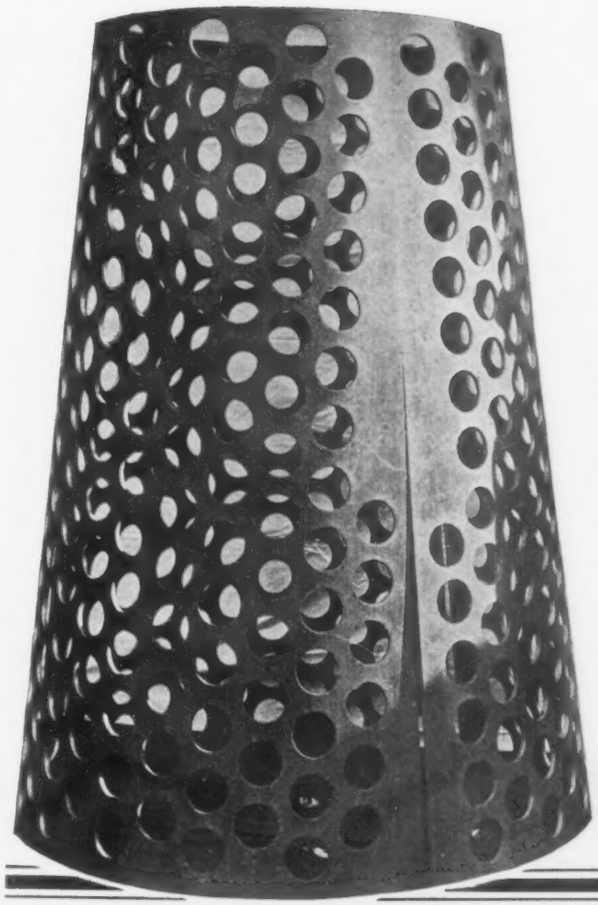

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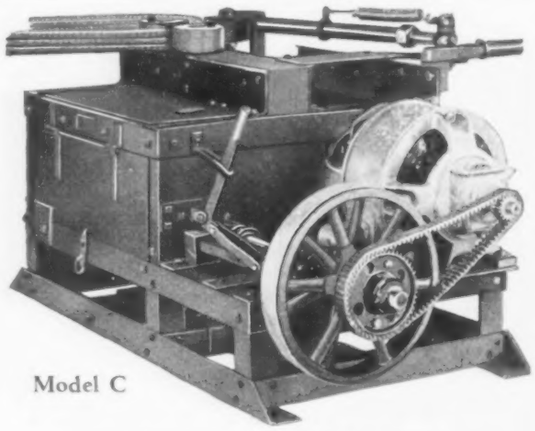

Model C

THE KARDONG CIRCLE (Silent Chain Drive) BENDER

Circles of any size required in reinforcing work from 18" in diameter up can be made on this bender. Changes of radius can be made in the same circle, without stopping machine with lever adjustment. Where speed and large capacity are required this machine will give unfailing satisfaction. It is the right machine for the fabricator having a heavy tonnage of reinforcing circles. As high as five one-half inch Bars can be bent in one operation.

Ask for catalogue of our complete line of reinforcing steel benders.

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"STANDARD" SWAGERS

—with nine great features

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- Heavy Construction—
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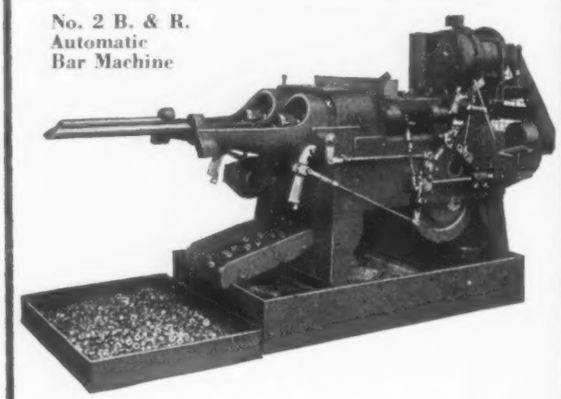
- Positive Door Lock—
- Bronze Bearings—
- Roller Cage of Forged Steel—
- Oil Reservoir Lubrication
- Adaptable to Motor Drive
- High Grade Workmanship
- All Wearing Surfaces Renewable—
- Capacities 0" to 4¾".

STANDARD
MACHINERY COMPANY
AUBURN, RHODE ISLAND

No. 2 B. & R. Automatic Bar Machine



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Proven Advantages of B. & R. Automatic Bar Machines for Making Nuts

More Nuts from given weight of stock used.
Higher Grade of Product.
More Production per spindle per hour.
Repeat orders verify these claims.

These machines are built in four sizes, covering range of nut sizes from ¼" to 2" U. S. Std. Will handle either cold-drawn or hot-rolled bar stock.

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Etna Rotary Swagers have earned the approbation of manufacturers for increased output and perfect performance in reducing and tapering steel rods to any given dimension.

With hydraulic feed for hot or cold operations the ETNA is a necessary unit if accuracy and production are wanted. Made in different sizes. Write for estimates to fit your need.

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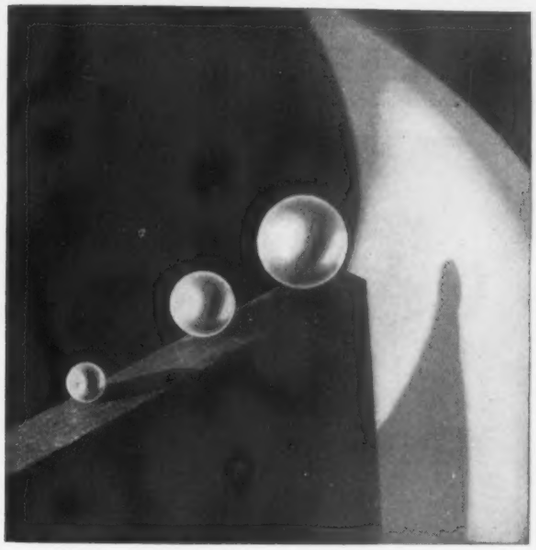

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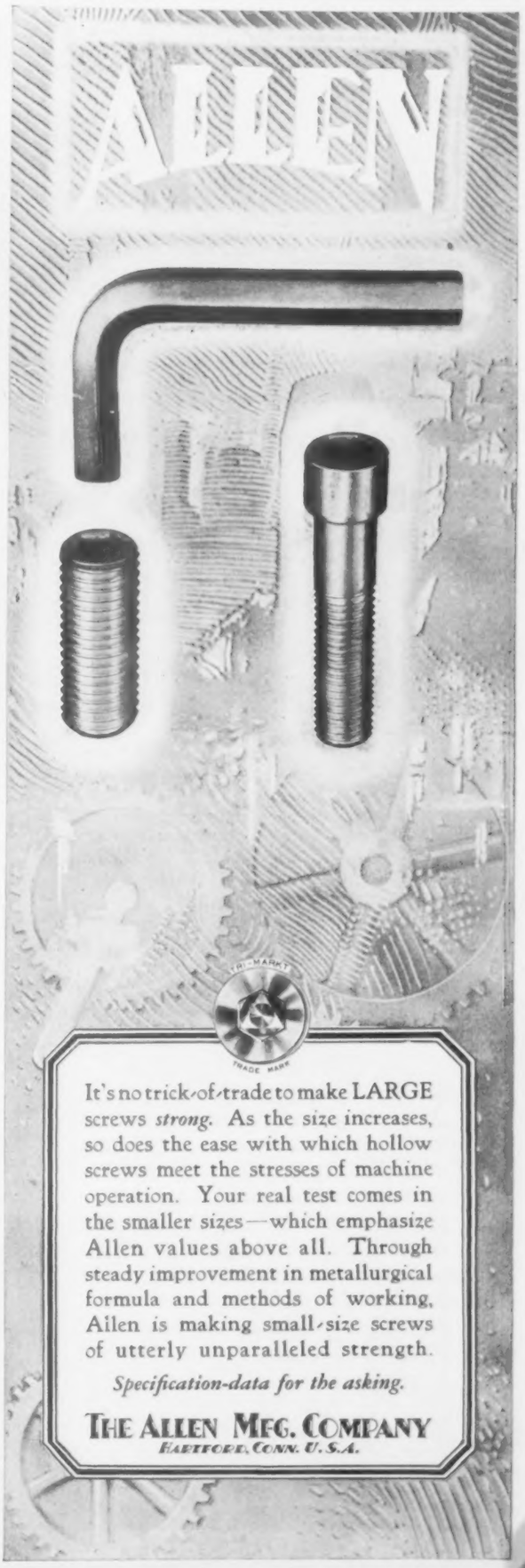

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Fine small Hardware Castings, Ingot Molds for Brass and Copper, Manhole Frames and Covers, Building Castings, General Machinery Castings.

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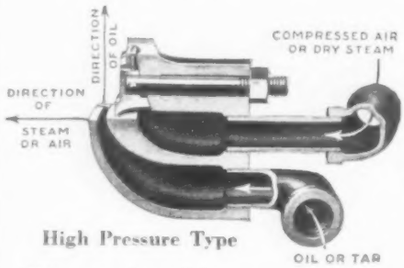

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CASTINGS
of Uniform Quality
ARE PERMANENT

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LOW	56490	37210	22.6
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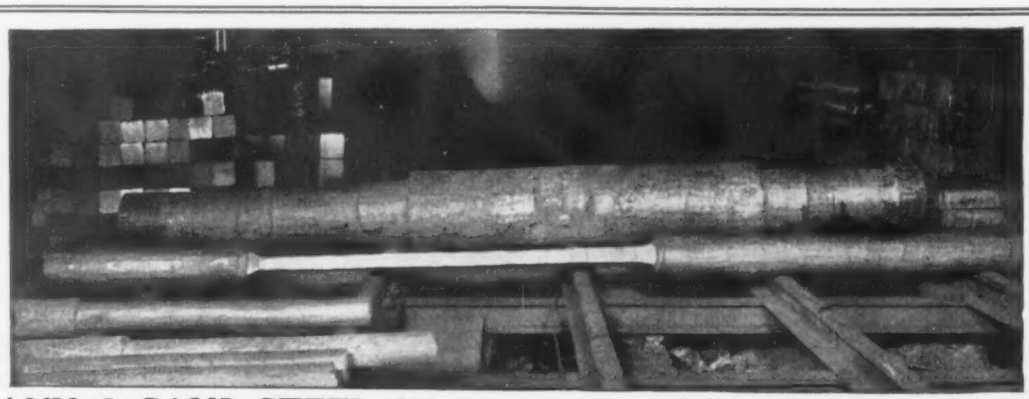

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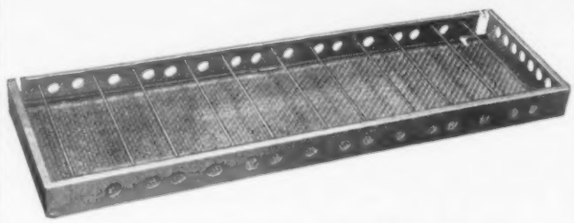

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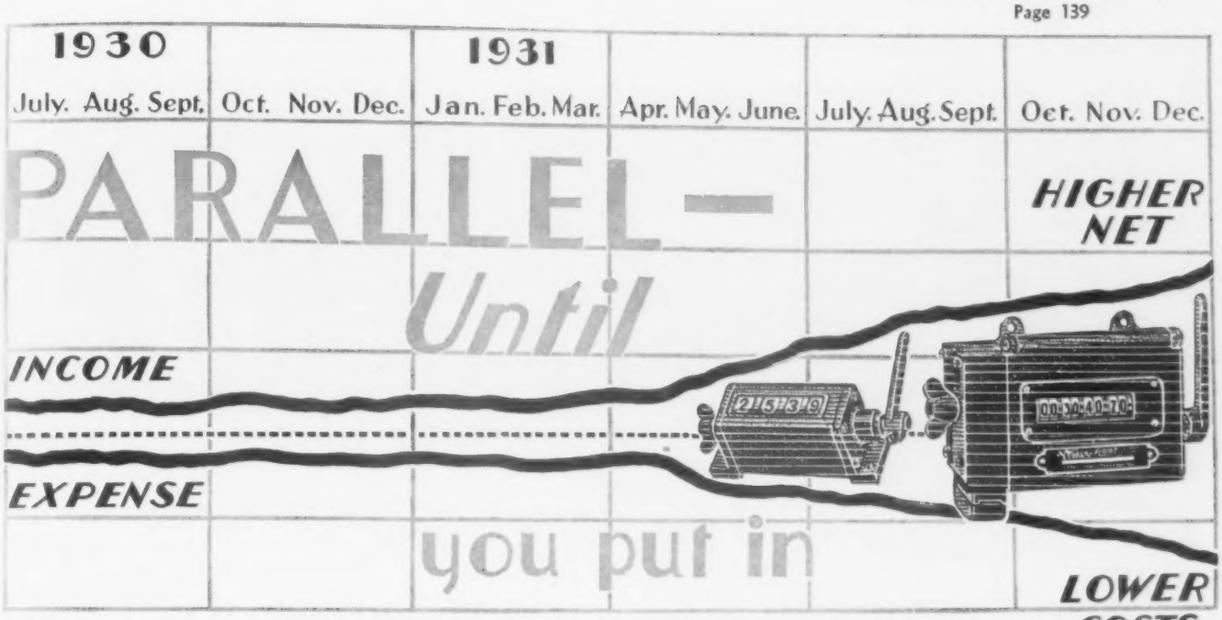

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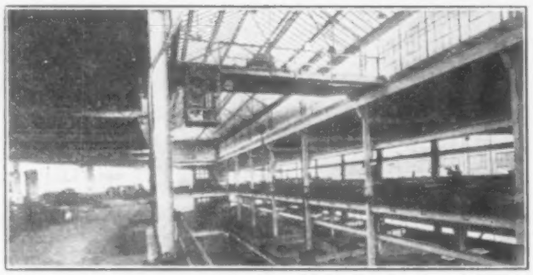

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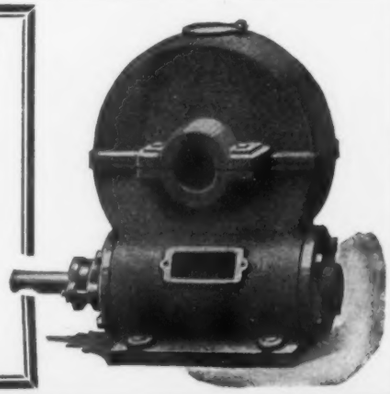

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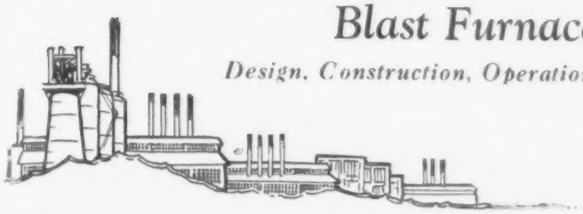

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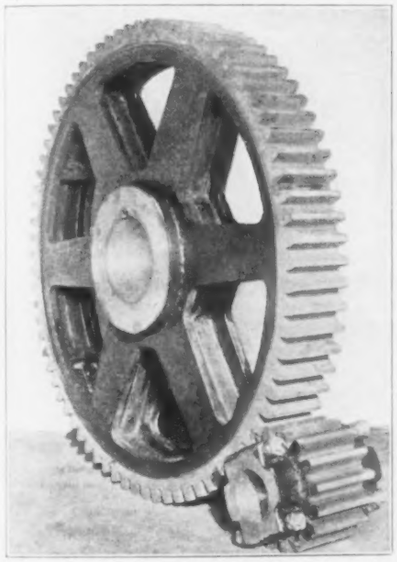

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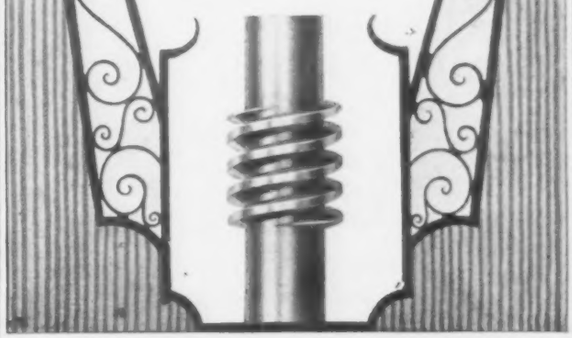

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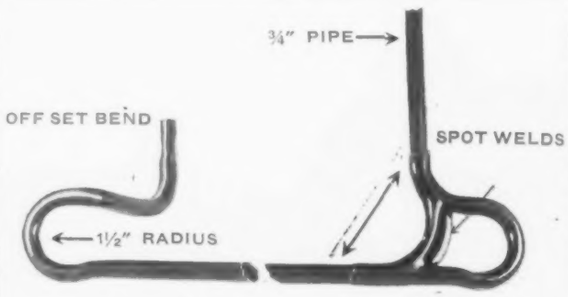

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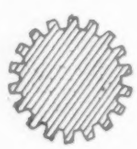

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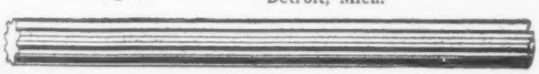

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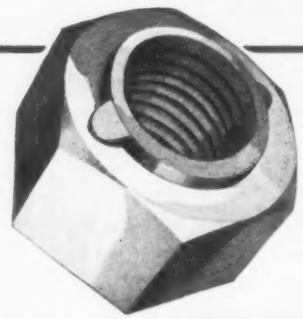

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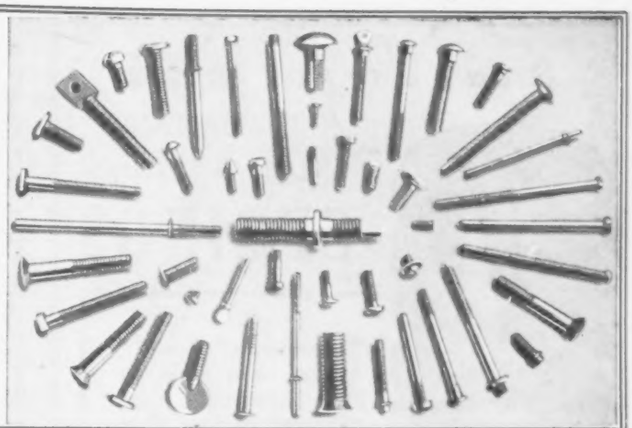

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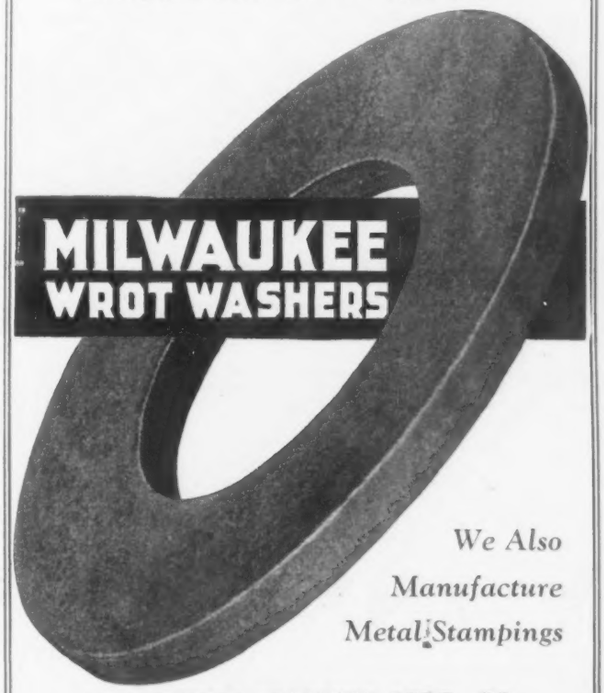

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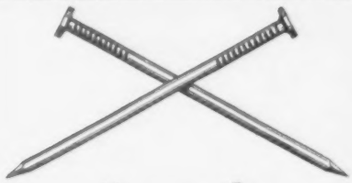

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Light and Heavy
SPRINGS

"American" made springs save time in your assembling department because they are uniformly accurate.

Furthermore, they help maintain the high standard of your product because they retain their resiliency.

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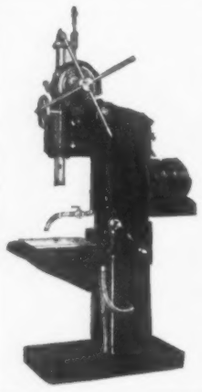

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For Second Operations on Screw Machine Products and Small Parts

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FOUNDRY ISSUE

of* THE IRON AGE, *April 30

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It is timed to coincide with the Foundrymen's Convention, May 4th to 7th.

It will reach all subscribers just before the show and will be distributed to visitors and exhibitors *at* the show.

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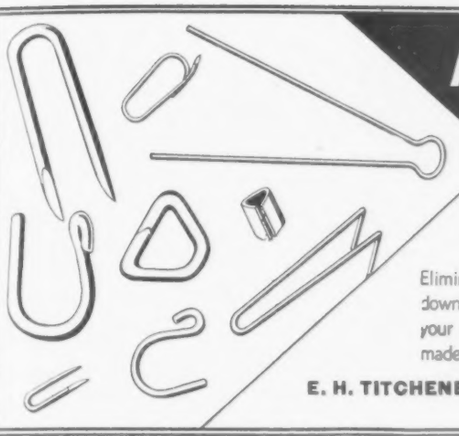

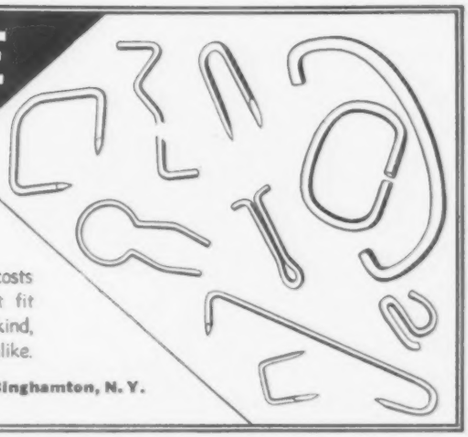

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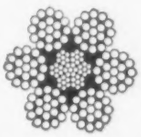

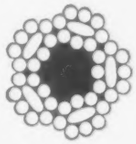

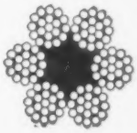

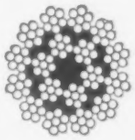

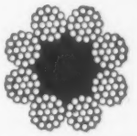

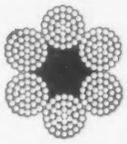

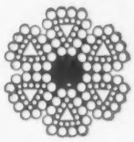

In successful Wire Rope usage construction is a factor quite as important as the proper selection of material.

The accompanying illustrations show cross section views of some of the various constructions we furnish. Every construction is made according to the "Leschen" standard.

If you are experiencing any Wire Rope trouble, probably either the construction or the quality is not suited to your particular work. Our Engineering Department will gladly advise with you, without putting you under any obligation.

Established 1857

A. Leschen & Sons Rope Co.

Makers of
HERCULES (Red-Strand) WIRE ROPE
ST. LOUIS, U. S. A.

New York Chicago Denver San Francisco

HOLD YOUR HANDS LIKE THIS

Note how naturally your fingers lie against each other—like the strands in Tru-Lay Preformed Wire Rope

NOW DO THIS

Note the pressure between your fingers—and how they spring apart when you uncross them. This illustrates the friction and internal stress in ordinary wire rope.

THERE IS A DIFFERENCE IN WIRE ROPE

In Tru-Lay, wires and strands are preformed—they lie naturally in position. Each strand carries an equal share of the load and wear. Internal stress is eliminated.

That is why Tru-Lay Preformed Wire Rope gives 30% to 300% increased service depending on the nature of the service and character of equipment.

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TRADE **TRU-LAY** MARK
(REG. U. S. PAT. OFF.)

M. D. HUBBARD SPRING CO.

SOUTH SAGINAW AND JESSIE STREETS
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ESTABLISHED 1905

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SPECIAL WIRE SHAPES SMALL STAMPINGS
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Floor NEVERSLIP *Plates*

Certain places in Industry possess more "slip hazards" than others . . . Shop and Factory Floors, Trench Covers, all Walkways, Stair Treads—these offer a perpetual opportunity for slippage accidents. Protect them, in the interests of Safety and Economy, with the "Perfect Diamond Pattern" floor plate NEVERSLIP. *We are pioneers in the manufacture of raised diamond floor plates.* SEND FOR SAMPLES AND LITERATURE.

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the emblem of safety

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See FOUNDRY ISSUE ANNOUNCEMENT on page 146

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SPECIAL MACHINERY

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One to Six Spindles
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can be furnished in multi-spindle vertical, horizontal and turret type machines. Write for catalogue of these high production machines of ⅝" capacity.
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Double-Housing Openside and Switch Planers
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Tool revolving—3 sizes
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See Page Facing Reading March 19 issue

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(Swings to Horiz. Position when Desired)
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Hammond Machinery Builders
KALAMAZOO, MICHIGAN
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Gardner Disc Grinders

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50,000 South Bend Lathes in Use

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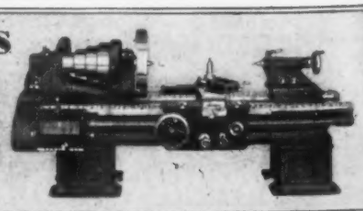

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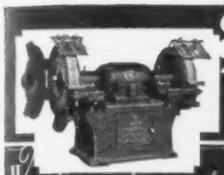

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PORTABLE ELECTRIC TOOLS
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Will Double Your Output
Equipped with two tools, cuts twice as fast.
Made in six sizes—two types of drive.
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Either Horizontal or Vertical Spindle Type
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Cutting-Off Machines
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We also manufacture a large line of turret machinery for finishing cast iron, steel and brass.

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A Flexible Shaft Machine of a Hundred Uses
Automatic Adjustment to position. Speed range 875 to 10,500 R.P.M. Power . . . Flexibility . . . . Control. Equipped for Die Sinking, Tool Making, Polishing, Grinding, Paint Removal, Routing, Milling, Drilling and Snagging. New uses being found daily.
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MERRELL
PIPE THREADING MACHINES
For BETTER Threads
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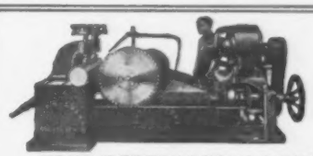

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CHISEL BLANKS—HIGH SPEED CUT-OFF MACHINES
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PIPE THREADING and CUTTING MACHINES
In sizes from ¼" to 18" inclusive
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Collapsible Taps, Self-opening Die Heads. Threading Machines, Pipe Cutting-Off Machines.
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Pipe Cutting and Threading Machines give Economy
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Ranges ¼-2" to 8-16"
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327 Garden St. Bridgeport, Conn.
Most Threads Per Dollar Invested

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We make the regular Huntington (Pattern) for all sizes.
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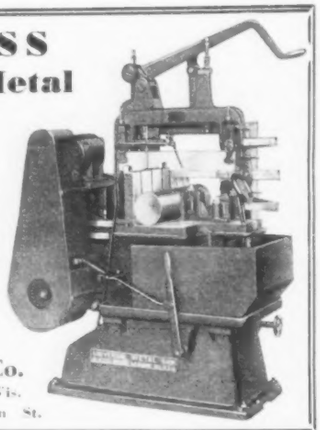
"Since 1892"
Springfield Ohio
SAFETY

PEERLESS
High Speed Metal Sawing Machines



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Twist Drills—Hobs
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The NEW LOGAN CATALOG S-25 describes a complete line of air operated devices for every work-holding requirement; including Air Valves, Chucks, Cylinders (rotating, non-rotating), Arbor Presses, Ejecting and Reducing Valves, Special Devices. Write.

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WHITON LATHE CHUCKS

Complete lines of Independent, Universal and Combination Chucks
Lathe *and* Drill Chucks
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Five sizes—capacities 1⅝" to zero. Cuts off bolts straight and smooth, close to work and any length—averaging 1000 an hour. No skilled help required. Also other important Time and Labor Savers—Pneumatic and Hand-operated; Drills, Hammers, Wire and Bolt Clippers; Shears, Punches, Rivetless Metal Seamers; Flue Expanders, Etc.; Powerful, Handy, Simple Design, Compactly Built.

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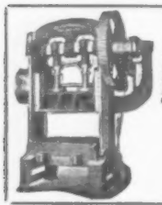

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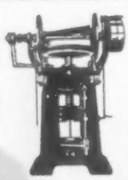
Birdsboro 26 Castings Rolling Mill Equipment Birdsboro 30 Castings
Be sure to note full page ad in this week's "Steel"



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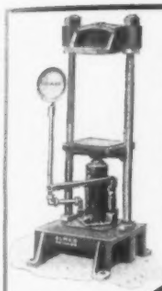

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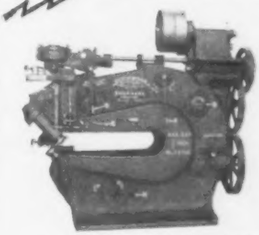

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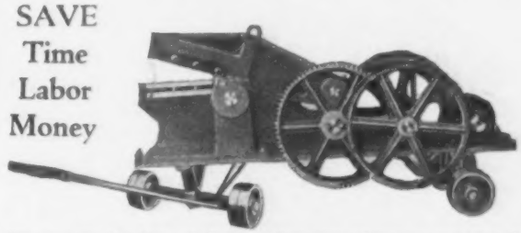

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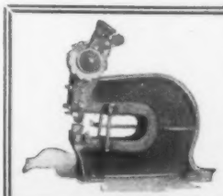

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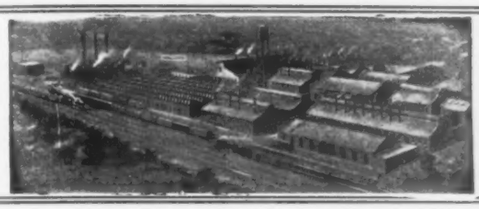

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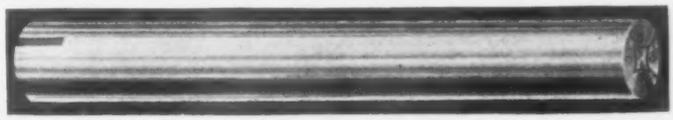

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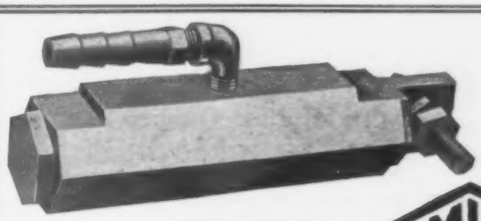

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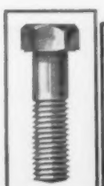

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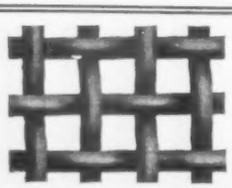

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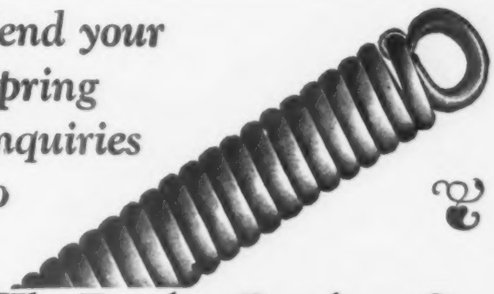

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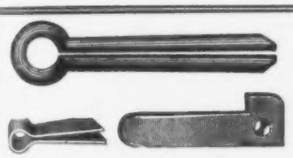

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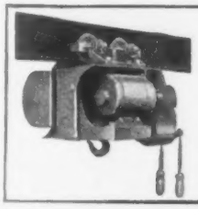
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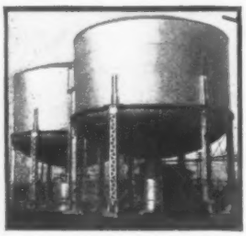

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ANGLES, BEAMS, CHANNELS AND TEES
Bethlehem (Pa.) Steel Company
Carnegie Steel Co., Pittsburgh
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Phoenix Iron Co., Philadelphia.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scullin Steel Co., St. Louis, Mo.
Weirton (W. Va.) Steel Co.

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West Steel Casting Co., The Cleveland.

APPRAISERS
Standard Appraisal Co., 6 Church St., N. Y. C.

ARMORING MACHINES—Wire, Cable, Hose, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chi.

AUCTIONEERS
Freeman, Samuel T. & Co., Philadelphia.

AXLES—Car or Locomotive
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.

AXLES—Upset Forged
Amer. Forge Co., 2621 So. Hoyne Ave., Chicago.

BALING PRESSES—Hydraulic
Galland-Henning Mfg. Co., Milwaukee
Hydraulic Press Mfg. Co., The, Columbus, Ohio.

BALING PRESSES—Scrap Metal
Galland-Henning Mfg. Co., Milwaukee.

BALLS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BALLS—Forged Chrome Steel for Pulverizing
Philadelphia (Pa.) Steel & Iron Co.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
New Departure Mfg. Co., Bristol, Conn.

BANDS—Steel
Akron-Selle Co., Akron, Ohio.
Bethlehem (Pa.) Steel Company
Republic Steel Corp., Youngstown, Ohio.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Globe Mach. & Stpg. Co., Cleveland
Ransohoff, N., Inc., Cincinnati, Ohio.

BARRELS—Steel Shop
Cleveland (O.) Wire Spring Co.

BARRELS—Tumbling—See Tumbling Barrels

BARS—Alloy
Bethlehem (Pa.) Steel Company.
Republic Steel Corp., Youngstown, Ohio.

BARS—Cast Bronze
Buckeye Brass & Mfg. Co., Cleveland

BARS—Concrete, Reinforcing
Jones & Laughlin Steel Corp., Pittsburgh.
Lacrede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Phila.
Scullin Steel Co., St. Louis, Mo.

BARS—Steel
Ames, W. & Co., Jersey City, N. J.
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Philadelphia (Pa.) Steel & Iron Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago
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Timken Roller Bearing Co., Canton, Ohio
Weirton (W. Va.) Steel Co.

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Breese Bros. Co., Cincinnati.

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Fredericksen Co., Saginaw, Mich.
Stewart Die-Casting Corp., Chicago.

BEARINGS—Ball
Bantam Ball Bearing Co., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bearing Co., Newark, N. J.
New Departure Mfg. Co., Bristol, Conn.
Standard Machinery Co., Auburn, R. I.

BEARINGS—Brass and Bronze
American Manganese Bronze Co., Phila.
Buckeye Brass & Mfg. Co., Cleveland.
Erie (Pa.) Bronze Co.
Fredericksen Co., Saginaw, Mich.
Stewart Die-Casting Corp., Chicago.

BEARINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Radial
Bantam Ball Bearing Co., South Bend, Ind.

BEARINGS—Roller
Bantam Ball Bearing Co., South Bend, Ind.
Hyatt Roller Bearing Co., Newark, N. J.
Standard Machinery Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS—ROLLER TAPERED
Timken Roller Bearing Co., Canton, O.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.

BEARINGS—Thrust
Bantam Ball Bearing Co., South Bend, Ind.
Standard Mchry. Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, O.

BELT FASTENERS
Smith, F. P., & Co., Sharon Hills, Pa.

BELTING—Chain
Morse Chain Co., Ithaca, N. Y.

BELTING—For Grooved Pulleys
Dayton (Ohio) Rubber Mfg. Co.

BELTING—Leather
Houghton, E. F., & Co., Philadelphia.

BENCHES AND TABLES—Steel
Standard Pressed Steel Co., Jenkintown, Pa.

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BENDING MACHINES—Angle or I-Beams
Buffalo (N. Y.) Forge Co., 492 B'way.
Galland-Henning Mfg. Co., Milwaukee.
Smith, David H., & Sons, Inc., Foot of 51st St., Brklyn, N. Y.
Thomas Spacing Mach. Co., Pittsburgh.

BENDING MACHINES, BAR—Circle or Spiral
Kardong Bros., Inc., Minneapolis, Minn.

BENDING MACHINES—Hand and Power
American Pipe Bending Mch. Co., Boston.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Kane & Roach, Syracuse, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Yoder Co., The, Cleveland, O.

BENZOL RECOVERY PLANTS
Koppers Construction Co., The, Ptgh.

BILLETS—Alloy Steel
Bethlehem (Pa.) Steel Company.

BILLETS—Forging
Bethlehem (Pa.) Steel Company.
Heppenstall Co., Pittsburgh.
Republic Steel Corp., Youngstown, Ohio.

BILLETS—Steel
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Company.
Inland Steel Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

BLANKS—Brass and Copper
Bridgeport (Conn.) Brass Co.

BLANKS—Gear & Pinion
Bethlehem (Pa.) Steel Company.
Edgewater Steel Co., Pittsburgh.

BLANKS—Gear & Pinion, Upset Forged
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.

BLOCKS—Chain
Wright Mfg. Co., Bridgeport, Conn.

BLOCKS—Creosoted
Jennison-Wright Co., Toledo

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BLOWERS—Pressure
Ampliomo Co., Long Island City, N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Champion Blower & Forge Co., Lancaster Pa.

BLOWERS—Rotary Positive
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BOILER HEADS—Flanged and Dished
Bethlehem (Pa.) Steel Company.

BOILERS—Return Tubular
Muskegon (Mich.) Boiler Wks.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOLT CUTTERS
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Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
Acme Machinery Co., Cleveland.
Economy Engng. Co., The, Wilmington, O.
Kent Mch. Co., The, Cuyahoga Falls, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

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BOLTS—Expansion
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BOLTS—Special
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Track
Inland Steel Co., Chicago, Ill.

BOLTS AND NUTS
Ames, W. & Co., Jersey City, N. J.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Bethlehem (Pa.) Steel Company.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Rhode Island Tool Co., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago
Security Machine Products Co., Cleveland.
United Screw & Bolt Corp., Cleveland, Ohio.

BORING, DRILLING AND MILLING MACHINES—Horizontal
Barnes, W. F., & John Co., Rockford, Ill.
Defiance (O.) Mch. Wks.
Hill, Clarke & Co. of Chicago, 847 W. Washington Blvd., Chicago, Ill.
Lucas Machine Tool Co., Cleveland.
Universal Boring Mch. Co., Hudson, Mass.

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Bullard Co., The, Bridgeport, Conn.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.

BORING BARS
Bullard Co., The, Bridgeport, Conn.

BORING MACHINES—Diamond
Ex-Cell-O Aircraft & Tool Corp., Detroit

BORING MACHINES—Jig
Pratt & Whitney Co., Hartford, Conn.

BORING AND TURNING MILLS—Vertical
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Cincinnati (O.) Planer Co.

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Union Steel Casting Co., Pittsburgh.
United Engng. & Fdry. Co., Pittsburgh.

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Cutler-Hammer Inc., Milwaukee.

BRAKES—Metal Forming
Dreis & Krump Mfg. Co., Chicago
Minster (O.) Machine Co.
Ohl, Geo. A., & Co., Inc., Newark, N. J.

BREECHINGS
Muskegon (Mich.) Boiler Works

BRICK—Chrome
General Refractories Co., Philadelphia.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Philadelphia.
Stowe-Fuller Refractories Co., The, Cleve.

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N.Y.
General Refractories Co., Philadelphia.
Harbison-Walker Refractories Co., Pgh.
Stowe-Fuller Refractories Co., The, Cleve.

BRICK—Magnesite
General Refractories Co., Philadelphia.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Philadelphia.

BRICK—Silica
General Refractories Co., Philadelphia.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Philadelphia.

BRIDGE BUILDERS
Lakeside Bridge & Steel Co., 103 Villard Ave., Milwaukee, Wis.
McClintic-Marshall Co., Bethlehem, Pa.
Phoenix Iron Co., Philadelphia.
Shoemaker Bridge Co., Pottstown, Pa.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Philadelphia.

BROACHES
Amer. Broach & Mch. Co., Ann Arbor, Mich.
Lapointe Mch. Tool Co., Hudson, Mass.

BROACHING MACHINES
Amer. Broach & Mch. Co., Ann Arbor, Mich.
Lapointe Mch. Tool Co., Hudson, Mass.

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Orton Crane & Shovel Co., Chicago.

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Elevator
Hendrick Mfg. Co., Carbondale, Pa.

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Single Line
Milwaukee (Wis.) Electric Crane & Hoist Div. of Harnischfeger Corp.

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Austin Co., The, Cleveland
Freeman, Samuel T. & Co., Philadelphia.

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Truscon Steel Co., Youngstown, Ohio.

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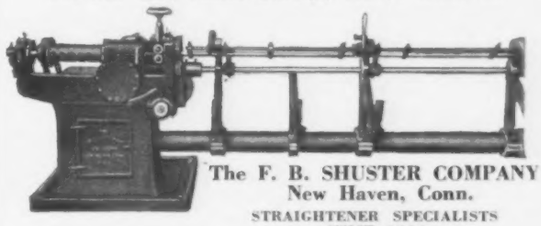

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Mechanite Institute, The, 3631 Parkinson Ave., Detroit, Mich.

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Sessions Foundry Co., The, Bristol, Ct.
Spencer's, I. S. Sons, Inc., Guilford, Ct.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Toledo (O.) Mch. & Tool Co.

CASTINGS—High Test & Alloy Iron
Mechanite Institute, The, 3631 Parkinson Ave., Detroit, Mich.

CASTINGS—Malleable
Carbon Steel Casting Co., Lancaster, Pa.
Fort Pitt Malleable Iron Co., Pittsburgh.
Link-Belt Co., Indianapolis, Ind
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Alloy Cast Steel Co., Marion, Ohio.

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Mechanite Institute, The, 3631 Parkinson Ave., Detroit, Mich.

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American Steel Foundries, Chicago.
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Mechanite Institute, The, 3631 Parkinson Ave., Detroit, Mich.

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Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

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Logansport (Ind.) Mch. Co.

CHUCKS—Drill
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Cushman Chuck Co., Hartford, Conn.

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Oakite Prod., Inc., 22 Thames St., N.Y.C.

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Fairbanks, Morse & Co., Chicago.
Kent Mch. Co., The, Cuyahoga Falls, Ohio.

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Cutler-Hammer Inc., Milwaukee.
Magnetic Mfg. Co., 626 So. 28th St., Milwaukee.

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Hayward Co., The, 50 Church St., N. Y. C.
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Link-Belt Co., Chicago.

COILING MACHINES—Metallic, Hose, Speedometer, Casing, Resistance Coils, Wire Spirals, Etc.
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Pickands Mather & Co., Cleveland.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.
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Spencer Turbine Co., Hartford, Conn.
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CONCRETE CONSTRUCTION
Austin Co., The, Cleveland.

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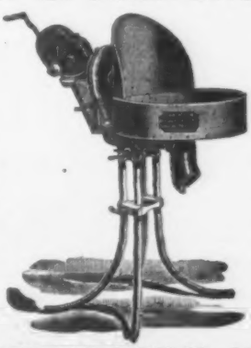

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Holcroft & Co., Detroit.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Swindell-Dressler Corp., Box 1753, Ptgh.

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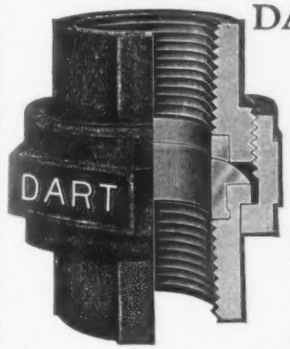
DART UNIONS



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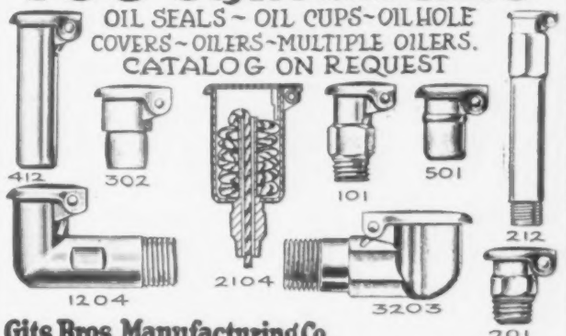

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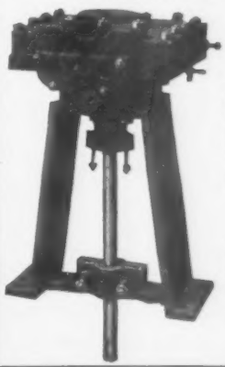

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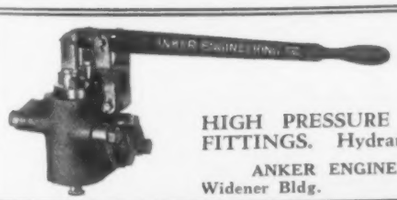

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Rockwell, W. S., Co., 50 Church St., N.Y.C.

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American Electric Furnace Co., Boston.
Amer. Gas Furnace Co., Elizabeth, N. J.

FURNACES—Heat Treating, Electric
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Holcroft & Co., Detroit.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Strong, Carlisle & Hammond Co., Cleve.
Swindell-Dressler Corp., Box 1753, Ptgh.

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Swindell-Dressler Corp., Box 1753, Ptgh.

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Laughlin, Alex., & Co., Ptgh.
Stevens, Arthur L., Corp., Chicago.
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Vaughn Mchry. Co., Cuyahoga Falls, O.

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Platt Bros. & Co., The, Waterbury, Ct.

GAGES—Plug and Snap
Haynes Stellite Co., 30 E. 42nd St., N.Y.C.

GAGES—Pressure and Vacuum
Bristol Co., Waterbury, Conn.
Marshalltown (Iowa) Mfg. Co.

GAGES—Thread Lead
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GALVANIZING PLANTS—For Sheets
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GALVANIZING & TINNING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

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Wood, R. D., & Co., Philadelphia.

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Koppers Construction Co., The, Ptgh.

GAS WASHERS
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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

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United Engng. & Fdry. Co., Pittsburgh.

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Horsburgh & Scott Co., Cleve.
Philadelphia (Pa.) Gear Works
Poole Engng. & Mch. Co., Balto., Md.

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Perkins Mch. & Gear Co., 100 Circuit Ave., Springfield, Mass.
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Ferguson Gear Co., Gastonia, N. C.
Gears & Forgings, Inc., 3124 Woodhill Rd., Cleveland.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
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Horsburgh & Scott Co., Cleve.
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Norton Co., Worcester, Mass.
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Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

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Thompson Grinder Co., Springfield, O.

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Norton Co., Worcester, Mass.

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Landis Mch. Co., Inc., Waynesboro, Pa.

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Production Machine Co., Greenfield, Mass.

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Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

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Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

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Morey & Co., Inc., 410 Broome St., N. Y. C.
Ritterbush & Co., Inc., 30 Church St., N.Y.C.
Woonsocket (R. I.) Mch. & Press Div.

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Pratt & Whitney Co., Hartford, Conn.

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Safety Grinding Wheel & Mch. Co., The, Springfield, O.

GRINDING MACHINES—Tool
LeBlond, R. K., Mch. Tool Co., Cinn.
Norton Co., Worcester, Mass.
Taylor & Fenn Co., Hartford, Ct.

GRINDING MACHINES—Universal
Norton Co., Worcester, Mass.
Simmons Mach. Tool Corp., Albany, N. Y.
Thompson Grinder Co., Springfield, O.

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Defiance (O.) Machine Works

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Carborundum Co., The, Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

HACK SAW BLADES—See Saws—Hack Saw Blades

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Moloch Fdry. & Mch. Co., Kaukauna, Wis.

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Yoder Co., The, Cleveland.

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Industrial Brownhoist Corp., Cleveland.

HAMMERS—Drop
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Chambersburg (Pa.) Engng. Co.
Morgan Engng. Co., Alliance, O.
Standard Machinery Co., Auburn, R.I.

HAMMERS—Pneumatic Forging
Sullivan Machinery Co., Chicago.

HAMMERS—Steam
Industrial Brownhoist Corp., Cleveland.
Morgan Engng. Co., Alliance, O.

HANGERS—Factory Door
Myers, F. E., & Bro. Co., Ashland, Ohio

HANGERS—Shaft
Hyatt Roller Bearing Co., Newark, N. J.
Hyman, Joseph, & Sons, Phila.

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Wilson-Maeulen Co., Inc., 738 E. 143d St., N. Y. C.

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Hanna Eng. Works, Chicago.
Ridgway, Craig & Son Co., Coatesville, Pa.

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Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Union Mfg. Co., New Britain, Conn.
Wright Mfg. Co., Bridgeport, Conn.

HOISTS—Electric
American Crane Co., Inc., The, Friendship, N. Y.
American MonoRail Co., The, Cleveland.
Box Crane & Hoist Corp., Phila.
Browning, Victor R., & Co., Inc., Cleveland, Ohio.
Detroit (Mich.) Hoist & Mach. Co.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Industrial Brownhoist Corp., Cleveland.
Mallory Machry. Corp., Baltimore.
Maris Brothers, Inc., Phila.
Payne, N. B., & Co., 25 Church St., N. Y. C.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Roeper Crane & Hoist Works, Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Electric Traveling
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Euclid (O.) Crane & Hoist Co.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Monorail
Euclid (O.) Crane & Hoist Co.
Milwaukee (Wis.) Electric Crane & Hoist Div. of Harnischfeger Corp.
Reading (Pa.) Chain & Block Corp.
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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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HOLDERS—Nipple
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Barnes Drill Co., Inc., Rockford, Ill.

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Birdsboro (Pa.) Steel Fdry. & Mch. Co.
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Dudgeon, Richard, Inc., 24-26 Columbia St., New York City.
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French Oil Mill Mchry. Co., Piqua, O.
Lake Erie Engng. Corp., Buffalo, N. Y.
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Erdle Perforating Co., Rochester, N. Y.

INGOTS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

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IRON—Chain
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IRON—Stainless
Firth-Sterling Steel Co., McKeesport, Pa.

IRON—Staybolt
Bethlehem (Pa.) Steel Company.

JACKS—Hydraulic
Dudgeon, Richard, Inc., 24-26 Columbia St., New York City.

JIGS, FIXTURES, TOOLS, ETC.—See Tools, Jigs, Fixtures, Etc.

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Baker Bros., Inc., Toledo, O.

LAMPS—Mercury Vapor
General Electric Vapor Lamp Co., Hoboken, N. J.

LATHE DOGS
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Williams, J. H., & Co., Buffalo, N. Y.

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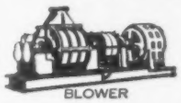
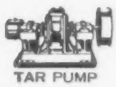
ROOTS—CONNERSVILLE-WILBRAHAM

(Division of The Stacey Engineering Company)


BLOWER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Bullard Co., The, Bridgeport, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cinn.
Monarch Mch. Tool Co., The, Sidney, Ohio.
Pratt & Whitney Co., Hartford, Conn.

LATHES—Bench
Pratt & Whitney Co., Hartford, Conn.
South Bend (Ind.) Lathe Works.

LATHES—Chucking
Jones & Lamson Mach. Co., Springfield, Vt.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cinn.

LATHES—Engine
Cincinnati (O.) Lathe & Tool Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
LeBlond, R. K., Mch. Tool Co., Cinn.
Lodge & Shipley Mch. Tool Co., Cinc.
Monarch Mch. Tool Co., The, Sidney, Ohio.
Osborne & Sexton Mchry. Co., Cincinnati, O.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
South Bend (Ind.) Lathe Works.

LATHES—Gap Bed
South Bend (Ind.) Lathe Works.

LATHES—Roll
Lewis Foundry & Mach. Co., Ptgh.
United Engng. & Fdry. Co., Pittsburgh.

LATHES—Second-Hand
Eastern Machinery Co., Cincinnati.
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Morey & Co., Inc., 410 Broome St., N. Y. C.
Ritterbush & Co., Inc., 30 Church St., N. Y. C.
Russell Mch. Co., Ptgh.
Seifreat-Listad Mchry. Co., Dayton, O.
Simmons Mach. Tool Corp., Albany, N. Y.
Woonsocket (R. I.) Mch. & Press Div.

LATHES—Spinning
Adriance Mach. Works, Inc., 82 Richard St., Brooklyn, N. Y.

LATHES—Turret
Bardons & Oliver, Cleveland.
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Lathe & Tool Co.
Jones & Lamson Mch. Co., Springfield, Vt.

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Aetna-Standard Engng. Co., Youngstown, O.

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Baker, J. E., Co., York, Pa.

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Harbison-Walker Refractories Co., Ptgh.

LINING—Cupola
Harbison-Walker Refractories Co., Ptgh.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Atlas Car & Mfg. Co., Cleve.

LOCOMOTIVES—Gasoline
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Industrial
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., Cleve.

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Wolverine Tube Co., Detroit.

LUMBER—Creosoted or Zinc Treated
Century Wood Preserving Co., Ptgh.

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Cavagnaro, John J., Harrison, N. J.
Cowdrey Mch. Wks., 30 Summer St., Fitchburg, Mass.
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General Mach. Works, York, Pa.
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Marlin Firearms Co., The, New Haven, Ct.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
New Monarch Mch. & Stpg. Co., Des Moines, Iowa

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Dony, D. E., Rochester, N. Y.
Eastern Machinery Co., Cincinnati.
Emerman, Louis E., & Co., Chicago.
Exley, E. L., Mchry. Co., Chicago.
General Mchry. Corp., Boston, Mass.
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Marr-Galbreath Mchry. Co., Ptgh.
Midland Steel & Equip. Co., Chicago, Ill.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N. Y. C.
Moyer, J. N., Philadelphia.
O'Brien Mchry. Co., Phila.
Randle Mchry. Co., 1772 Powers St., Cincinnati, Ohio.
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Simmons Mach. Tool Corp., Albany, N. Y.
Wachs-Gregg & Co., Chicago.
White, A. D. Machry. Co., Chicago.
Whittlesey Body Mfg. Co., Bridgeport, Conn.

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Konigslow, Otto, Mfg. Co., Cleve.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Niagara Falls, N. Y.
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila.

MAGNETS—Electro Industrial
Dings Magnetic Separator Co., Milwaukee.

MAGNETS—Lifting
Cutler-Hammer Inc., Milwaukee.
Electric Controller & Mfg. Co., Cleve.
Ohio Electric Mfg. Co., The, Cleveland.

MANGANESE METAL
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

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Nicetown Plate Washer Co., Inc., Phila.

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Noble & Westbrook Mfg. Co., Hartford Ct.

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Bossert Corp., The, Utica, N. Y.
Cuyahoga Spring Co., Cleve.
Detroit (Mich.) Metal Specialty Corp.
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Glome Mach. & Stmp. Co., Cleve.
Torrington (Ct.) Co.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.

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Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

METALS—Acid and Corrosion Resistant
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

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Edge Hill Silica Rock Co., New Brunswick, N. J.

MILLING MACHINES—Automatic
Pratt & Whitney Co., Hartford, Conn.

MILLING MACHINES—Die Trimming & Sinking
Billings & Spencer Co., Hartford, Ct.

MILLING MACHINES—Horizontal
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Defiance (O.) Mch. Wks.

MILLING MACHINES—Second Hand
Eastern Machinery Co., Cincinnati.
Simmons Mach. Tool Corp., Albany, N. Y.
Woonsocket (R. I.) Mch. & Press Div.

MILLING MACHINES—Universal
Brown & Sharpe Mfg. Co., Prov., R. I.

MILLING MACHINES—Vertical
Reed-Prentice Corp., Worcester, Mass.

MIXING MACHINES—Sand
Bartlett, C. O. & Snow Co., Cleveland.
National Engineering Co., Chicago.

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Arcade Mfg. Co., Freeport, Ill.
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Reading (Pa.) Chain & Block Corp.

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American MonoRail Co., The, Cleveland.
Reading (Pa.) Chain & Block Corp.

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Century Electric Co., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Leland Electric Co., The, Dayton, Ohio.
Ohio Electric Mfg. Co., The, Cleveland.
Robbins & Myers, Inc., Springfield, Ohio

MOTORS—Electric—Fractional Hp.
Ohio Electric Mfg. Co., The, Cleveland.

MOTORS—Electric, Second-Hand
Relyea Co., Inc., 147 W. 18th St., N. Y.
Delta Equipment Co., Philadelphia.
Motor Repair & Mfg. Co., Cleveland.
O'Brien Machry. Co., Phila.

NAILS—Wire
Bethlehem (Pa.) Steel Company.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., Hartford, Ct.

NUT MAKING MACHINERY
Budd-Ranney Eng. Co., The, Columbus, O.
National Mchry. Co., Tiffin, Ohio.

NUTS—Acorn
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio.

NUTS—Castellated
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United Screw & Bolt Corp., Cleveland, Ohio.

NUTS—Cold Punched
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United Screw & Bolt Corp., Cleveland, Ohio.

NUTS—Hot Pressed
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NUTS—Milled
United Screw & Bolt Corp., Cleveland, Ohio.
Westfield (Mass.) Nut Co.

NUTS—Semi-Finished
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OIL STONES
Carborundum Co., The, Niagara Falls, N. Y.

ORES—Chrome, Lump and Ground
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila.

ORES—Iron
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Pickands Mather & Co., Cleveland.
Pilling & Co., Inc., Phila.
Shenango Furnace Co., Pittsburgh.

ORES—Manganese
Lavino, E. J., & Co., Phila.

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Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Young Bros. Co., Detroit.

OVENS—Coke and By-Product Recovery
Koppers Construction Co., The, Pittsburgh.

OVENS—Core and Mold
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Holcroft & Co., Detroit.
Young Bros. Co., Detroit.

OVENS—Cross Regenerative
Koppers Construction Co., The, Ptgh.

OVENS—Drying
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Detroit (Mich.) Sheet Metal Wks.
Drying Systems, Inc., Chicago, Ill.
Young Bros. Co., Detroit.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Crawford Oven Co., The, 203 Shelton Ave., New Haven, Conn.
Drying Systems, Inc., Chicago, Ill.
Young Bros. Co., Detroit.

OVERHEAD CARRYING EQUIPMENT—See Monorail—Overhead

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

PACKING—Leather
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

PANS—Grinding
National Engineering Co., Chicago.

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Boyle, John, Jr., Washington, D. C.

PATENTING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

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Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

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PHOSPHORIZERS
McCullough-Dalzell Crucible Co., Ptgh.

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PICKLING MACHINES
Aetna-Standard Engng. Co., Youngstown, O.
Ransohoff, N., Inc., Cincinnati, O.

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Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Company.
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Lavino, E. J., & Co., Phila.
Pickands Mather & Co., Cleveland.
Pilling & Co., Inc., Phila.
Republic Steel Corp., Youngstown, Ohio.
Rogers Brown & Crocker Bros., Inc., 11 East 40th St., N. Y. C.
Shenango Furnace Co., Pittsburgh.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Walter-Wallingford & Co., Cincinnati.

PILING—Steel Sheet
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.

PINIONS—Wire and Rod
Rathbone, A. B., & J., Palmer, Mass.

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Champion Rivet Co., Cleveland, Ohio.

PINS—Chain
Champion Rivet Co., Cleveland, Ohio.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland, O.

PINS—Coupler
Champion Rivet Co., Cleveland, Ohio.

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Wood, R. D., & Co., Philadelphia.

PIPE—Chrome Alloy
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.

PIPE—Fusion Welded
Petroleum Iron Wks., Co., Sharon, Pa.

PIPE—Genuine Wrought Iron
Keating, E. F., Co., 452 Water St., N. Y. C.

PIPE—Hammer Welded
National Tube Co., Pittsburgh.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry and N. 13th St., Bklyn, N. Y.
Greenpoint Iron & Pipe Co., Inc., 187-197 Maspeth Ave., Bklyn, N. Y.
Hudson Pipe & Supply Co., Bayonne, N. J.

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Abendroth & Root Mfg. Co., Newburgh, N. Y.
McClintic-Marshall Co., Bethlehem, Pa.

PIPE—Seamless Steel
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.

PIPE—Spiral Riveted
Abendroth & Root Mfg. Co., Newburgh, N. Y.
Taylor Forge and Pipe Works, Chicago.

PIPE—Spiral Welded
American Rolling Mill Co., Middletown, O.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Republic Steel Corp., Youngstown, Ohio.

PIPE—Welded, Electric
Republic Steel Corp., Youngstown, Ohio.

PIPE—Wrought Iron
Keating, E. F., Co., 452 Water St., N. Y. C.

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Newbold, R. S., & Son Co., Norristown, Pa.

PIPE BENDS
Yawman Metal Products, Inc., Rochester, N. Y.

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Murchey Mch. & Tool Co., 951 Porter St., Detroit.
Newbold, R. S., & Son Co., Norristown, Pa.

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Curtis & Curtis Co., 337 Garden St., Bridgeport, Ct.
Landis Mach. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
Pipe Machry. Co., The, Cleveland.
Saunders, D., Sons, Yonkers, N. Y.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

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Power Piping Co., Pittsburgh.

PIPING CONTRACTORS
Power Piping Co., Pittsburgh.

PISTON RODS
Heppenstall Co., Pittsburgh.

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Cleveland (O.) Planer Co., The.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Gray, G. A., Co., Cincinnati.
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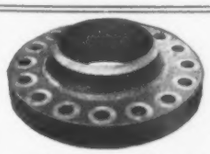
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Carnegie Steel Co., Pitgh.

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Jones & Laughlin Steel Corp., Pittsburgh.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton (W. Va.) Steel Co.

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Udylite Process Co., Detroit, Mich.

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Hubbard, M. D., Spring Co., Pontiac, Mich.

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Kent Mch. Co., The, Cuyahoga Falls, Ohio.

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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.

POLISHING MACHINES—Belt
Production Machine Co., Greenfield, Mass.

POWER TRANSMITTING MACHINERY
American Pulley Co., Philadelphia.
Kent Mch. Co., The, Cuyahoga Falls, Ohio.

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Littell, F. J., Mach. Co., Chicago.

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Champion Sheet Metal Co., Inc., Cortland, N. Y.
Detroit (Mich.) Metal Specialty Corp.

PRESSED STEEL PARTS
Brantley & Wolcott Mfg. Co., Waterbury, Conn.
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Gessler, Pieschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Lansing (Mich.) Stamping Co.
Metal Specialty Co., 1503 W. Sixth St., Cincinnati.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Worcester (Mass.) Pressed Steel Co.

PRESSES—Baling
Galland-Henning Mfg. Co., Milwaukee.

PRESSES—Bending or Straightening
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

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Bliss, E. W., Co., 53rd St. & 2nd Ave., Brkln., N. Y.
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PRESSES—Die
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

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Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
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Taylor & Fenn Co., Hartford, Ct.

PRESSES—Forging
Lucas Mch. Tool Co., Cleve.
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

PRESSES—Forging
Morgan Engineering Co., Alliance, O.
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

PRESSES—Forming and Bending
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Hot and Cold Plate
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.

PRESSES—Hydraulic
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Elmes, Chas. F., Engrg. Works, Chicago.
French Oil Mill Machry. Co., Piqua, O.
Galland Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Lake Erie Engng. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
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Wood, R. D., & Co., Philadelphia.

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PRESSES—Power
Adriance Machine Works, Inc., 82 Richards St., Bklyn, N. Y.
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Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cleveland (O.) Punch & Shear Wks. Co.
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V. & O. Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.
Zeh & Hahnemann Co., Newark, N. J.

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Streine Tool & Mfg. Co., New Bremen, O.

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Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Standard Machinery Co., Auburn, R. I.

PRESSES—Trimming
Toledo (O.) Mch. & Tool Co.

PULLEY MACHINERY
Avey Drilling Mch. Co., Cincinnati.

PULLEYS—Friction Clutch
Caldwell, W. E., Co., 260 Brandels St., Louisville, Ky.

PULLEYS—Iron, Solid and Split
Caldwell, W. E., Co., 260 Brandels St., Louisville, Ky.
Kent Mch. Co., The, Cuyahoga Falls, Ohio.

PULLEYS—Magnetic
Cutler-Hammer Inc., Milwaukee.
Magnetic Mfg. Co., 626 So. 28th St., Milwaukee, Wis.

PULLEYS—Steel, Rim Solid and Split
Hyman, Joseph, & Sons, Phila.

PULVERIZERS
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleveland.

PULVERIZERS—Coal
Bartlett, C. O. & Snow Co., Cleveland.

PUMPS—Boiler Feed
Fairbanks, Morse & Co., Chicago.

PUMPS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee.
De Laval Steam Turbine Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
Penna Pump & Compressor Co., Easton, Pa.

PUMPS—Electric
Fairbanks, Morse & Co., Chicago.
Myers, F. E., & Bro. Co., Ashland, Ohio

PUMPS—Hand and Power
Myers, F. E., & Bro. Co., Ashland, Ohio

PUMPS—Hydraulic
Elmes, Chas. F., Engrg. Works, Chicago.
Fairbanks, Morse & Co., Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
LaPointe Mch. Tool Co., The, Hudson, Mass.
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

PUMPS—Pneumatic Air Lift
Sullivan Machinery Co., Chicago.

PUMPS—Power
Fairbanks, Morse & Co., Chicago.

PUMPS—Rotary Positive
Roots-Connersville-Wilbraham Div. of The Stacey Eng. Co., Connersville, Ind.

PUMPS—Steam
Fairbanks, Morse & Co., Chicago.

PUMPS—Vacuum
Paper & Textile Mchry. Co., The, Sandusky, Ohio.
Sullivan Machinery Co., Chicago.

PUNCHES—Pneumatic
Hanna Engineering Wks., Chicago

PUNCHES AND DIES
Cleveland (O.) Punch & Shear Wks. Co.
Marchant, Geo. F., Co., Chicago.

PUNCHING AND SHEARING MACHINES
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, Ohio.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.
Thomas Spacing Mach. Co., Pitgh.

PURIFIERS—Oil.
De Laval Steam Turbine Co., Trenton, N. J.

PYROMETERS—Indicating
Bristol Co., Waterbury, Conn.
Wilson-Maeulen Co., Inc., 738 E. 148d St., N. Y. C.

RAIL SPLICE BARS
Ames, W., & Co., Jersey City, N. J.

RAILS
Bethlehem (Pa.) Steel Company.
Foster, L. B., Co., Pittsburgh.
Frank, M. K., 220 E. 42nd St., N. Y. C.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton (W. Va.) Steel Co.

RAILS—Relaying
Continental Iron & Steel Co., 33 Rector St., N. Y. C.
Foster, L. B., Co., Pittsburgh.
Frank, M. K., 220 E. 42nd St., N. Y. C.
Perry, Buxton, Duane Co., Boston.
Sherwood, E. C., 48 Church St., N. Y. C.
Weiss, B. M., Philadelphia.

RAILWAY EQUIPMENT & SUPPLIES
Fairbanks, Morse & Co., Chicago.
Fort Pitt Malleable Iron Co., Pittsburgh.
Foster, L. B., Co., Pittsburgh.
Scullin Steel Co., St. Louis, Mo.

REAMERS—Adjustable and Expansion
Barber-Colman Co., Rockford, Ill.
Cleveland (O.) Twist Drill Co.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

REFRACTORIES—See Brick—Cement—Facing Clay and Fire Clay

RINGS—Iron or Steel
Akron Selle Co., Akron, Ohio.
Edgewater Steel Co., Pittsburgh.
Heppenstall Co., Pittsburgh.
Milwaukee (Wis.) Forge & Mch. Co.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleve.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.

RIVET SETS
Cleveland (O.) Punch & Shear Wks. Co.
Hunter Saw & Mch. Co., 5660 Butler St., Pitgh.
Marchant, Geo. F., Co., Chicago.

RIVETING MACHINES
Allen, John F., Co., 372 Gerard Ave., N.Y.C.
Buffalo (N. Y.) Forge Co., 492 B'way.
Hanna Engrg. Works, Chicago.
Shuster, F. B., Co., New Haven, Conn.
Watson-Stillman Co., 103 Aldene Rd., Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

RIVETS
Bethlehem (Pa.) Steel Company.
Champion Rivet Co., Cleveland, Ohio.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.

RODS—Drill
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.

RODS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Haynes Stellite Co., 30 E. 42nd St., N.Y.C.

RODS—Wire
Jones & Laughlin Steel Corp., Pittsburgh.
Washburn Wire Co., Inc., 118th & Harlem River, N. Y. C.

ROLLING MACHINERY—Cold Rolling
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Lewis Foundry & Mach. Co., Pitgh.
United Engng. & Fdry. Co., Pittsburgh.
Yoder Co., The, Cleveland

ROLLING MACHINERY—Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Leveler
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Metal
Lewis Fdry. & Mch. Co., Pitgh.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Sheet Oiling
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MILL MACHINERY
Aetna-Standard Engng. Co., Youngstown, O.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Hoagland's, M., Sons Co., Rockaway, N. J.
Lewis Foundry & Mach. Co., Pitgh.
Hyde Park (Pa.) Fdry. & Mch.
Mackintosh-Hemphill Co., Pittsburgh.
Morgan Engng. Co., Alliance, Ohio.
National Roll & Fdry. Co., Avonmore, Pa.
Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Treadwell Engineering Co., Easton, Pa.
United Engng. & Fdry. Co., Pittsburgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

ROLLING MILLS—Copper Rod and Sheet
Aetna-Standard Engng. Co., Youngstown, O.
Hoagland's, M., Sons Co., Rockaway, N. J.
United Engng. & Fdry. Co., Pittsburgh.

ROLLING MILLS & INDUSTRIAL PLANTS
Foster, Frank B., Pittsburgh, Pa.

ROLLS—Alloy Steel
United Engng. & Fdry. Co., Pittsburgh.

ROLLS—Bending and Straightening
Baldwin-Southwark Corp. Southwark Fdry. & Mch. Co. Div., Phila.
Bertsch & Co., Cambridge City, Ind.
Bethlehem (Pa.) Steel Company.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Hendley & Whittemore Co., Beloit, Wis.
Lake Erie Engng. Corp., Buffalo, N. Y.
Marshalltown (Iowa) Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.

ROLLS—Brass, Bronze, Copper, Iron, Monel, Aluminum
Aetna-Standard Engng. Co., Youngstown, O.
Paper & Textile Mchry. Co., The, Sandusky, Ohio.

ROLLS—Galvanizing
Erie (Pa.) Forge Co.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Engng. Co., Youngstown, O.
American Steel Foundries, Chicago.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Hoagland's, M., Sons Co., Rockaway, N. J.
Hyde Park (Pa.) Fdry. & Mach. Co.
Lewis Fdry. & Mch. Co., Pittsburgh, Pa.
National Roll & Fdry. Co., Avonmore, Pa.
United Engng. & Fdry. Co., Pittsburgh

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Company.

ROOFING—Cement Tile
Federal-American Cement Tile Co., Chicago.

ROOFING—Concrete
Austin Co., The, Cleveland.

ROOFING—Concrete Slabs
Federal-American Cement Tile Co., Chicago.

ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., Middletown, Ohio.
Weirton (W. Va.) Steel Co.

ROOFING & SIDING—(Zinc) Corrugated & Plain
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
Udylite Process Co., Detroit, Mich.

RUST REMOVING
American Chemical Paint Co., Ambler, Pa.

SAND—Sand Blast
Cape May (N. J.) Sand Co.
Patch-Wegner Co., Inc., Rutland, Vt.

SAND—Steel Molding
Cape May (N. J.) Sand Co.

SAND BLAST EQUIPMENT AND MACHINES
Arcade Mfg. Co., Freeport, Ill.
Mott Sand Blast Mfg. Co., Inc., Chi.
Panghorn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., Cleveland, O.

SAND CUTTING AND SCREENING MACHINES
Bartlett, C. O. & Snow Co., Cleveland

SAND HANDLING EQUIPMENT
Bartlett, C. O. & Snow Co., Cleveland.
Beardsley & Piper Co., Chicago, Ill.
Hayward Co., The, 50 Church St., N. Y. C.
National Engineering Co., Chicago.

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Strip Steel Sheets
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Pickled and Auto Body Sheets
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Bessemer, Basic, Malleable, Foundry
Coal and Coke
OLIVER BLDG., PITTSBURGH UNION TRUST BLDG., CLEVELAND
THE S F Co.

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SAND MILLS
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SASH—Steel
Truscon Steel Co., Youngstown, Ohio.

SAWING MACHINES—Metal
Earle Gear & Mch. Co., Phila.
Kaspri-Lucas Mach. Works, Phila.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.

SAWS—Cold Metal
Hunter Saw & Mch. Co., 5660 Butler St., Pitgh.

SAWS—Friction
Ryerson, Jos. T., & Son, Inc., Chicago.

SAWS—Hack Saw Blades
Darwin & Milner, Inc., Cleveland.
Peerless Mch. Co., Racine, Wis.

SAWS—Hot Metal
Hunter Saw & Mch. Co., 5660 Butler St., Pitgh.

SAWS—Inserted Tooth, Cold
Hunter Saw & Mch. Co., 5660 Butler St., Pittsburgh.

SAWS—Sliding Frame
United Engng. & Fdry. Co., Pittsburgh.

SCALES
Buffalo (N. Y.) Scale Co., Inc., 1202 Niagara St.
Fairbanks, Morse & Co., Chicago.

SCRAP—Iron and Steel
Perry, Buston, Doane Co., Boston.

SCREENS—Perforated Metal
Chicago Perforating Co., Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

SCREENS—Vibrating
Link-Belt Co., Chicago.

SCREENS—Woven Wire
Cleveland (O.) Wire Cloth & Mfg. Co.
Michigan Wire Cloth Co., 2117 Howard St., Detroit

SCREW MACHINE PRODUCTS
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Bell, David, Co., Inc., The, Buffalo, N. Y.
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Eastern Mch. Screw Corp., New Haven, Ct.
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Screw Mch. Products Corp., Prov., R. I.
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SCREW MACHINERY—Automatic
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SCREW MACHINERY—Automatic Wood
Cook, Asa S., Co., Hartford, Ct.

SCREW MACHINERY—Hand
Jones & Lamson Mch. Co., Springfield, Vt

SCREW MACHINERY—Multiple Spindle
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SCREWS—CAP
Cleveland (O.) Cap Screw Co.
Corbin Screw Corp., New Britain, Ct.
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Reed & Prince Mfg. Co., Worcester, Mass.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
United Screw & Bolt Corp., Cleveland, Ohio.

SCREWS—Coach or Lag
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SCREWS—Cold Headed
Cleveland (O.) Cap Screw Co., The.
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Reed & Prince Mfg. Co., Worcester, Mass.
United Screw & Bolt Corp., Cleveland, Ohio.

SCREWS—Safety Set
Allen Mfg. Co., The, Hartford, Ct.
Bristol Co., Waterbury, Conn.
Progressive Mfg. Co., Torrington, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS—Set
Ottemiller, Wm. H., Co., Inc., York, Pa
Reed & Prince Mfg. Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleve.
United Screw & &Bolt Corp., Cleveland, Ohio.

SCREWS, Socket, Head, Cap
Allen Mfg. Co., The, Hartford, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., The, Cleveland

SCREWS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.

SCREWS—Wood
Corbin Screw Corp., New Britain, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

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Carborundum Co., The, Niagara Falls, N.Y.

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Armel, James P., Pittsburgh.
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Essley, E. L., Mchry. Co., Chicago
Exeter Mch. Wks., Inc., Wilkes-Barre, Pa.
Farrell Machinery Co., St. Louis, Mo.
Freeman, Samuel T., & Co., Philadelphia.
Gluckler, L. A., St. Louis, Mo.
Hill, Clarke & Co., of Chicago, 647 W. Washington Blvd., Chicago, Ill.
Indianapolis (Ind.) Mchry. & Supply Co., Inc.
Iroquois Machinery Co., Buffalo, N. Y.
Johnson, Wm. C., & Sons, Mchry. Co., St. Louis, Mo.
Llewellyn, Thomas J., & Co., Pittsburgh.
Lodge & Shipley Mch. Tool Co., Cinci
MacCabe, T. B., Phila.
Marr-Galbreath Mchry. Co., Pitgh.
Midland Steel & Equip. Co., Chicago, Ill.
Milburn, Alexander Co., The, Baltimore, Md.
Mines Mchry. Co., Saginaw, W. S., Mich.
Molitor, Chas., Mchry. Co., Chicago, Ill.
Morey & Co., Inc., 410 Broome St., N. Y. C.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
O'Brien Machry. Co., Phila.
Osborne & Sexton Mchry. Co., Columbus, O.
Packard Motor Car Co., Detroit, Mich.
Quaker City Iron Wks., Philadelphia.
Randle Mchry. Co., 1772 Powers St., Cincinnati, Ohio.
Reliance Mchry. Sales Co., Pitgh.
Ritterbush & Co., Inc., 30 Church St., N.Y.C.
Riverside Mchry. Depot, Detroit.
Ross Power Equip. Co., Indianapolis.
Russell Mch. Co., Pitgh.
Seifreat-Elstad Mchry. Co., Dayton, Ohio.
Simmons Mach. Tool Corp., Albany, N. Y.
White A. D. Machry Co., Chicago
Whittlesey Body Mfg. Co., Bridgeport, Conn.
Woonsocket (R. I.) Mch. & Press Div.

SEPARATORS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 South 28th St., Milwaukee.
Ohio Electric Mfg. Co., The, Cleveland.

SHAFTING—Cold Drawn
Cumberland (Md.) Steel Co.

SHAFTING—Smooth Forged or Rough Turned
Erie (Pa.) Forge Co.

SHAFTING—Steel
Bethlehem (Pa.) Steel Company.
Cumberland (Md.) Steel Co.

SHAFTING—Tubular Material For
National Tube Co., Pittsburgh.

SHAFTING—Turned and Polished
Cumberland (Md.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

SHAFTS—Flanged, Upset Forged
American Forge Co., 2621 S. Hoyne Ave., Chicago.

SHAPES—Steel
Phoenix Iron Co., Phila.

SHAPES—Wire
Roebling's, John A., Sons Co., Trenton, N. J.
Titchener, E. H., & Co., Binghamton, N. Y.

SHAPING MACHINES—Horizontal
Gould & Eberhardt, Newark, N. J.
Ryerson, Jos. T., & Son, Inc., Chicago.
Smith & Mills Co., Cinci

SHAPING MACHINES—Vertical
Pratt & Whitney Co., Hartford, Conn.

SHEAR BLADES AND KNIVES
Heppenstall Co., Pittsburgh.
Marshalltown (Iowa) Mfg. Co.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Alligator
Canton (O.) Fdry. & Mch. Co.
Hendley & Whittemore Co., Beloit, Wis.
Hoagland's, M., Sons Co., Rockaway, N. J.
Long & Allstatter Co., Hamilton, Ohio.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., Brooklyn, N. Y.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach., Co., Pitgh., Pa.

SHEARING MACHINES—Bar
Beatty Mch. & Mfg. Co., Hammond, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, Ohio.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.
United Engng. & Fdry. Co., Pittsburgh.

SHEARING MACHINES — Beam and Channel
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engng. & Fdry. Co., Pittsburgh.

SHEARING MACHINES—Billet
Buffalo (N. Y.) Forge Co., 492 B'way.
Morgan Engineering Co., Alliance, O.
Pels, Henry & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engng. & Fdry. Co., Pittsburgh.

SHEARING MACHINES — Continuous Automatic
Yoder Co., The, Cleveland

SHEARING MACHINES — Continuous Sheet & Pack
Streine Tool & Mfg. Co., New Bremen, O.

SHEARING MACHINES — Metal Slitting
Buffalo (N. Y.) Forge Co., 492 B'way.
Hendley & Whittemore Co., Beloit, Wis.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES — Metal Slitting Gang
Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Long & Allstatter Co., Hamilton, Ohio.
Marshalltown (Iowa) Mfg. Co.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Pitgh., Pa.
United Engng. & Fdry. Co., Pittsburgh.
Wood, R. D., & Co., Philadelphia
Yoder Co., The, Cleveland.

SHEARING MACHINES—Rotary for Irregular Cutting
Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Rotary Slitting Gang
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Sheet and Plate
Dreis & Krump Mfg. Co., Chicago.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner), St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Squaring
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.
Toledo (O.) Mch. & Tool Co.

SHEET BARS
Jones & Laughlin Steel Corp., Pittsburgh.

SHEET METAL MACHINERY
Adriance Machine Wks., Inc., 82 Richards St., Bklyn, N. Y.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Dreis & Krump Mfg. Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Kane & Roach, Syracuse, N. Y.
Newbold, R. S., & Son Co., Norristown, Pa.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Standard Machinery Co., Auburn, R. I.
Streine Tool & Mfg. Co., New Bremen, O.
Toledo (O.) Machine & Tool Co.
V & O Press Co., Hudson, N. Y.
Yoder Co., The, Cleveland.

SHEET METAL WORK
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Keller Blower Co., Inc., Buffalo, N. Y.
St. Paul (Minn.) Corrugating Co.

SHEETS—Aluminum
Erdle Perforating Co., Rochester, N. Y.

SHEETS—Auto Body
American Rolling Mill Co., Middletown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Republic Steel Corp., Youngstown, Ohio
Weirton (W. Va.) Steel Co.

SHEETS—Black
Bethlehem (Pa.) Steel Company.
Inland Steel Co., Chicago, Ill.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, Ohio
Bethlehem (Pa.) Steel Company.
Inland Steel Co., Chicago, Ill.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

SHEETS—Copper Steel
Inland Steel Co., Chicago, Ill.

SHEETS—Electrical
American Rolling Mill Co., Middletown, Ohio.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Republic Steel Corp., Youngstown, Ohio.

SHEETS—Enameling Stock
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

SHEETS — Enameling Stock (Genuine Open-Hearth Iron)
American Rolling Mill Co., Middletown, Ohio.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., Middletown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Firth-Sterling Steel Co., McKeesport, Pa.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Republic Steel Corp., Youngstown, Ohio
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Full Finished
American Rolling Mill Co., Middletown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Seneca Iron & Steel Co., Buffalo, N. Y.
Weirton (W. Va.) Steel Co.

SHEETS—Galvanized, Flat and Corrugated
American Rolling Mill Co., Middletown, Ohio.
Bethlehem (Pa.) Steel Company.
Inland Steel Co., Chicago, Ill.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Long Terne
Weirton (W. Va.) Steel Co.

SHEETS—Metal Furniture
Eastern Rolling Mill Co., Balto., Md.
Republic Steel Corp., Youngstown, Ohio.
Seneca Iron & Steel Co., Buffalo, N. Y.

SHEETS—Pickled
Weirton (W. Va.) Steel Co.

SHEETS—Polished
American Rolling Mill Co., Middletown, Ohio.

SHEETS—Zinc
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

SHEETS—Tin Mill Black
Weirton (W. Va.) Steel Co.

SHELLS—Brass and Copper
Bridgeport (Conn.) Brass Co.
Foster, Theodore W., & Bro. Co., Prov., R. I.

SHELVING—Steel
Cleveland (O.) Wire Spring Co.

SLINGS—Wire Rope
American Cable Co., Inc., 100 E. 45th St., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

SLOTTING MACHINES
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Nazel Engrg. & Mch. Wks., Phila.

SPACING TABLES—Punching & Shearing
Thomas Spacing Mach. Co., Pitgh., Pa.

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Ams, Max, Mch. Co., The, Bridgeport, Conn.
Baldwin-Southwark Corp., Southwark Fdry. & Mch. Co. Div., Phila.
Budd-Ramney Eng. Co., The, Columbus, O.
Bullard Co., The, Bridgeport, Ct.
Cook, Asa S., Co., Hartford, Ct.
Cowdrey Mch. Wks., 30 Summer St., Fitchburg, Mass.
Hartford (Ct.) Special Mchry. Co.
Kent Mch. Co., The, Cuyahoga Falls, Ohio.
Litteil, F. J., Mch. Co., Chicago.
Manville, E. J., Mach. Co., Waterbury, Ct.
Morgan Engineering Co., Alliance, O.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Treadwell Engineering Co., Easton, Pa.
Yoder Co., The, Cleveland.

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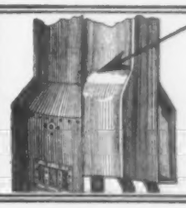
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Philadelphia (Pa.) Gear Works.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

SPIKES
American Steel & Wire Co., Chicago.
Ames, W., & Co., Jersey City, N. J.
Inland Steel Co., Chicago, Ill.

SPINDLES—Grinding
Ex-Cell-O Aircraft & Tool Corp., Detroit.

SPRING MAKING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS—Car
Amer. Spiral Spring & Mfg. Co., Ptgh.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.

SPRINGS—Wire, Coil or Flat
American Spiral Spring & Mfg. Co., Ptgh.
Amer. Spring & Mfg. Corp., Holley, Mich.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Cleveland (O.) Wire Spring Co.
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Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Bklyn., N. Y.
Miller & Van Winkle, Inc., 18 Bridge St. Bklyn, N. Y.
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Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.

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Boston Gear Works Sales Co., Norfolk Downs, Mass.
Dundore Mfg. Co., Reading, Pa.
Link-Belt Co., Chicago.
Whitney Mfg. Co., Hartford, Conn.

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Chicago (Ill.) Bridge & Iron Wks.
Meehan Boiler & Construction Co., Lowellsville, Ohio.
Muskegon (Mich.) Boiler Works

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Acme Stpg. & Mfg. Co., Pittsburgh.
Akron-Selle Co., Akron, Ohio.
American Pulley Co., Philadelphia.
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American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
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Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Behringer, E., Sheet Metal Wks., Inc., Newark, N. J.
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Breese Bros. Co., Cincinnati.
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Burgess-Norton Mfg. Co., Geneva, Ill.
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Cuyahoga Spring Co., Cleveland.
Davis Brake Beam Co., Johnstown, Pa.
Detroit (Mich.) Metal Specialty Corp.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Erdle Perforating Co., Rochester, N. Y.
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Hill, N. N., Brass Co., The, East Hampton, Conn.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Huebe! Mfg. Co., Inc., Newark, N. J.
Hunter Pressed Steel Co., Lansdale, Pa.
Koniglow, Otto, Mfg. Co., Cleveland.
Lansing (Mich.) Stamping Co.
Lee Spring Co., Inc., 30 Main St., B'klyn, N. Y.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn., N. Y.
Mullins Mfg. Corp., Salem, Ohio.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
New Monarch Mch. & Stpg. Co., Des Moines, Iowa
Parish Pressed Steel Co., Reading, Pa.
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
Stanley Works, The, New Britain, Ct.
Torrington (Ct.) Co.
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Veeder-Root, Inc., Hartford, Ct.
Welker-Hoops Mfg. Co., Middletown, Conn
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
Yawman Metal Products, Inc., Rochester, N. Y.
Youngstown Steel Car Corp., Niles, Ohio.

STAMPS—Steel Alphabets and Figures
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Noble & Westbrook Mfg. Co., Hartford, Ct.
Schwerdtle Stamp Co., Bridgeport, Conn.

STAPLES—Wire
Titchener, E. H., & Co., Binghamton, N. Y.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Associated Alloy Steel Co., Inc., Cleveland.
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Heppenstall Co., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, Ohio.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Carbon
Carnegie Steel Co., Pittsburgh.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Carbon Vanadium
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome
Associated Alloy Steel Co., Inc., Cleveland.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Manganese
Latrobe (Pa.) Electric Steel Co.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Chrome Nickel
Associated Alloy Steel Co., Inc., Cleveland.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Vanadium
Latrobe (Pa.) Electric Steel Co.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Rathbone, A. B. & J., Palmer, Mass.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Cold Rolled Strips
Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Athenia Steel Co., 135 William St., N. Y.
Cold Metal Process Co., Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Ryerson, Jos. T. & Son, Inc., Chicago.
Stanley Works, The, New Britain, Conn.
Superior Steel Corp., Grant Bldg., Ptgh.
Thomas Steel Co., Warren, Ohio.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Pittsburgh.
Wetherell Bros. Co., Cambridge, 39, Mass.
Worcester (Mass.) Pressed Steel Co.

STEEL—Cold Rolled Strips, Electro-Galvanized
Thomas Steel Co., Warren, Ohio.

STEEL—Crucible
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Wetherell Bros. Co., Cambridge 39, Mass.

STEEL—Die
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.

STEEL—Drill
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Electric
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., Canton, Ohio.

STEEL—High Speed
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Company.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Hot Rolled Strips
Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace Co., The, Bristol, Conn.
Griffin Mfg. Co., Erie, Pa.
Laclede Steel Co., St. Louis, Mo.
Latrobe (Pa.) Elec. Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Grant Bldg., Ptgh.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Pittsburgh.

STEEL—Magnet
Latrobe (Pa.) Elec. Steel Co.

STEEL—Open Hearth
Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Associated Alloy Steel Co., Inc., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Screw
Timken Roller Bearing Co., Canton, O.

STEEL—Special Analysis
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Timken Roller Bearing Co., Canton, O.
West Leechburg Steel Co., Pittsburgh.

STEEL—Spring
Athenia Steel Co., 135 William St., N. Y.
Barnes, Wallace, Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Company.
Republic Steel Corp., Youngstown, Ohio.
Timken Roller Bearing Co., Canton, Ohio.

STEEL—Stainless
Associated Alloy Steel Co., Inc., Cleveland.
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.

STEEL—Tool
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Company.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Darwin & Milner, Inc., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.
Milne, A., & Co., 745 Washington St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wetherell Bros. Co., Cambridge 39, Mass.

STEEL—Tool, Special Shapes
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Vanadium
Latrobe (Pa.) Elec. Steel Co.

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Perin & Marshall, 11 West 42nd St., N. Y. C.

STEEL PLATE CONSTRUCTION
Alco Products, Inc., 220 E. 42nd St., N.Y.C.
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Cole, R. D., Mfg. Co., Newnan, Ga.
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McClintic-Marshall Co., Bethlehem, Pa.
Meehan Boiler & Construction Co., Lowellsville, Ohio.
Muskegon (Mich.) Boiler Wks.
Petroleum Iron Works Co., Sharon, Pa.
Traylor Engng. & Mfg. Co., Allentown, Pa.

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Heppenstall Co., Pittsburgh.
United Engng. & Fdry. Co., Pittsburgh.

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Saunders', D., Sons, Yonkers, N. Y.

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Ross-Tacony Crucible Co., Philadelphia.

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Brassert, H. A., & Co., Chicago.

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Aetna-Standard Engng. Co., Youngstown, O.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Kane & Roach, Syracuse, N. Y.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Thomas Spacing Mch. Co., Ptgh., Pa.

STRAIGHTENING MACHINES—Wire
Lewis Mch. Co., The, Cleveland, Ohio.
Shuster, F. B., Co., New Haven, Conn.

STRUCTURAL IRON AND STEEL WORK
Austin Co., The, Cleveland.
Belmont Iron Wks., Philadelphia.
Bethlehem (Pa.) Steel Company.
Morgan Engng. Co., Alliance, Ohio.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.

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SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES
Etna Machine Co., The, Toledo, Ohio.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Torrington (Ct.) Co.

SWITCHES—Electric
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Barbour-Stockwell Co., Cambridge, Mass.

TANKS—Compressed Air, Gas, Oil and Water
Air-Tight Steel Tank Co., Ptgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Muskegon (Mich.) Boiler Wks.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Elevated Steel
Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.

TANKS—Elevated Wood
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Gasoline & Oil
Chicago (Ill.) Bridge & Iron Wks.

TANKS—Iron and Steel
Alco Products, Inc., 220 E. 42nd St., N.Y.C.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Chicago (Ill.) Bridge & Iron Wks.
Janney, Joseph A., Jr., Philadelphia.
Lancaster (Pa.) Iron Works, Inc.
Leader Iron Wks., Inc., Decatur, Ill.
McClintic-Marshall Co., Bethlehem, Pa.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Lead Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati, O.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Seamless Steel
National Tube Co., Pittsburgh.

TANKS—Water
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Welded
Air-Tight Steel Tank Co., Ptgh.
National Tube Co., Pittsburgh.
Scaife, Wm. B., & Sons Co., Pittsburgh.

TANKS—Wood
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati, O.
Woolford, G., Wood Tank Mfg. Co., Phila.

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Baker Bros., Inc., Toledo.
Defiance (O.) Machine Works
Ex-Cell-O Aircraft & Tool Corp., Detroit.

TAPPING MACHINES—Nuts
National Mchry. Co., Tiffin, Ohio.

TAPS—Collapsing
Geometric Tool Co., New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.

TAPS AND DIES
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit
Pipe Mchry. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

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TERNE PLATES—Copper Bearing
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THREAD ROLLING MACHINES
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

THREADING MACHINES
Geometric Tool Co., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

THREADING MACHINES—Automatic
Landis Mch. Co., Inc., Waynesboro, Pa.

(ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
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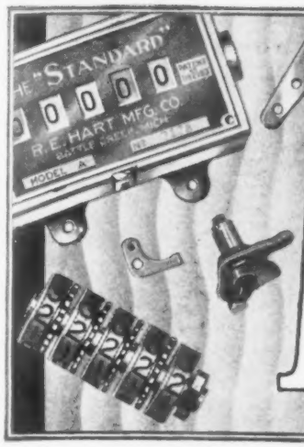

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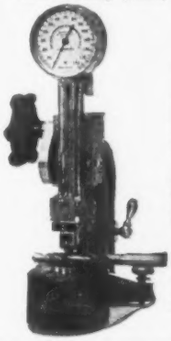

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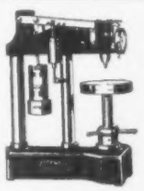

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Products Index

TIE PLATES
Inland Steel Co., Chicago, Ill.
Joliet (Ill.) Wrought Washer Co.
Weirton (W. Va.) Steel Co.

TIES—Creosoted
Century Wood Preserving Co., Ptgh.

TIES—Metal
Bethlehem (Pa.) Steel Company.

TILE—Cement Roofing
Federal-American Cement Tile Co., Chicago.

TIN PLATE
Jones & Laughlin Steel Corp., Pittsburgh.
National Assn. of Flat Rolled Steel Mfrs., Cleveland.
Weirton (W. Va.) Steel Co.

TIN PLATE MACHINERY
Aetna-Standard Engng. Co., Youngstown, O.

TINNERS' TOOLS AND MACHINES
Niagara Mch. & Tool Wks., Buffalo, N. Y.
Quinnesec Co., The (Not incorporated—H. Collier Smith, Owner), St. Marys, O.

TONGS—Chain Pipe
Williams, J. H., & Co., Buffalo, N. Y.

TOOL BITS
Haynes Stellite Co., 30 E. 42nd St., N.Y.C.

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago.
Williams, J. H., & Co., Buffalo, N. Y.

TOOLS, JIGS, FIXTURES, Etc.
Pratt & Whitney Co., Hartford, Conn.

TOOLS—Lathe
Armstrong Bros. Tool Co., Chicago.

TOOLS—Machinists
Billings & Spencer Co., Hartford, Conn.

TOOLS—Metal Cutting
Haynes Stellite Co., 30 E. 42nd St., N.Y.C.

TOOLS—Steam and Gas Fitters
Saunders', D., Sons, Yonkers, N. Y.

TOOLS—Tungsten Carbide
Ex-Cell-O Aircraft & Tool Corp., Detroit.
Firth-Sterling Steel Co., McKeesport, Pa.

TOOLS—Welded Tip
Haynes Stellite Co., 30 E. 42nd St., N.Y.C.

TORCHES—Blow
Anthony Co., Long Island City, N. Y.

TOWERS—Steel
Alco Products, Inc., 220 E. 42nd St., N.Y.C.
Caldwell, W. E., Co., 1249 Brook St., Louisville, Ky.
McClintic-Marshall Co., Bethlehem, Pa.

TOWERS—Transmission
McClintic-Marshall Co., Bethlehem, Pa.

TOWERS—Water—See Tanks—Elevated Steel and Elevated Wood

TRACK—Industrial
Bethlehem (Pa.) Steel Company.

TRACK—Monorail
American MonoRail Co., The, Cleveland.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TRACTORS AND TRAILERS—See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial—See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
Armington Engineering Co., Euclid, Ohio.
Reading (Pa.) Chain & Block Corp.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TRAMWAYS—Wire Rope
Broderick & Bascom Rope Co., St. Louis.
Leschen, A., & Sons Rope Co., St. Louis.

TRAPS—Steam and Radiator
Strong, Carlisle & Hammond Co., Cleve.

TROLLEYS
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 So. Jefferson St., Mendota, Ill.
Hayna Engineering Works, Chicago.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Co., Bridgeport, Conn.

TROLLEYS—Monorail
American MonoRail Co., The, Cleveland.

TRUCKS—Elevating (Power)
Crescent Truck Co., Lebanon, Pa.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.

TRUCKS, TRACTORS AND TRAILERS—Industrial
Atlas Car & Mfg. Co., Cleveland.
Chase Fdry. & Mfg. Co., Columbus, O.
Crescent Truck Co., Lebanon, Pa.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.

TUBE EXPANDERS
Dudgeon, Richard, Inc., 24-26 Columbia St., New York City.

TUBE FORMING MACHINES
Yoder Co., The, Cleveland.

TUBE MILL MACHINERY
Aetna-Standard Engng. Co., Youngstown, O.
Treadwell Engineering Co., Easton, Pa.
United Engng. & Fdry. Co., Pittsburgh.

TUBES—Boiler
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Tyler Tube & Pipe Co., The, Washington, Pa.

TUBES—Boiler, Charcoal Iron
Bethlehem (Pa.) Steel Company.
Keating, E. F., Co., 452 Water St., N. Y.
Tyler Tube & Pipe Co., Washington, Pa.

TUBES—Nickel Silver
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Timken Steel & Tube Co., The, Canton, O.

TUBING—Aluminum, Seamless
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Brass, Bronze, Copper, Monel, Aluminum (Centrifugally Cast)
Paper & Textile Mchry. Co., The, Sandusky, Ohio.

TUBING—Brass, Bronze, Copper or Nickel Silver
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Wolverine Tube Co., Detroit.

TUBING—Chrome Alloy
Delaware Seamless Tube Co., The, Auburn, Pa.

TUBING—Cylinder Finish
Delaware Seamless Tube Co., The, Auburn, Pa.

TUBING—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

TUBING—Seamless Steel
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.
Delaware Seamless Tube Co., The, Auburn, Pa.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Timken Roller Bearing Co., Canton, Ohio.

TUBING—Square and Rectangular
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Welded Steel
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Tyler Tube & Pipe Co., The, Washington, Pa.

TUBING MACHINERY—Brazed
Etna Machine Co., The, Toledo, Ohio.

TUBULAR PRODUCTS
Service Steel Co., Detroit.
Yawman Metal Products, Inc., Rochester, N. Y.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Globe Mach. & Stpg. Co., Cleveland.
Harsco[illegible] N. [illegible] Ohio.
Sly, W. W., Mfg. Co., Cleveland, Ohio.

TURBINES
De Laval Steam Turbine Co., Trenton, N. J.

TURBO—Compressors
Spencer Turbine Co., Hartford, Conn.

TURNTABLES
Canton (O.) Fdry. & Mch. Co.

TWIST DRILLS
Cleveland (O.) Twist Drill Co.
Union Twist Drill Co., Athol, Mass.

TYPE—Steel
Noble & Westbrook Mfg. Co., Hartford, Ct.

UNIONS
Dart, E. M., Mfg. Co., Prov., R. I.

VALVES—Air Operating
Galland-Henning Mfg. Co., Milwaukee.

VALVES—Gas and Air Reversing
Swindell-Dressler Corp., Box 1753, Ptgh.

VALVES—Gas, Water and Steam
Galland-Henning Mfg. Co., Milwaukee.
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Anker Engng. Co., Phila.
Baldwin-Southwark Corp., Southwark Fdry. & Mch. Co. Div., Phila.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Watson-Stillman Co., The, 103 Aldene Rd., Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

VISES—Machine Compensating
Avey Drilling Mch. Co., Cincinnati.

WASHERS—Bevel
Nicetown Plate Washer Co., Inc., Phila.

WASHERS—Iron or Steel
Griffin Mfg. Co., Erie, Pa.
Hager, C. & Sons Hinge Mfg. Co., St. Louis, Mo.
Joliet (Ill.) Wrought Washer Co.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Nicetown Plate Washer Co., Inc., Phila.
Shakeproof Lock Washer Co., Chicago.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
United Screw & Bolt Corp., Cleveland, Ohio.
Wrought Washer Mfg. Co., Milwaukee.

WASHERS—Lock
Shakeproof Lock Washer Co., Chicago.

WASHERS—Special
Shakeproof Lock Washer Co., Chicago.
United Screw & Bolt Corp., Cleveland, Ohio.

WASHERS—Spring Steel
Dunbar Bros. Co., Bristol, Conn.

WASHERS—Tempered
Barnes, Wallace Co., The, Bristol, Ct.
United Screw & Bolt Corp., Cleveland, Ohio.

WASHING MACHINES—For Metal Parts
Detroit (Mich.) Sheet Metal Wks.
Ransohoff, N., Inc., Cinn., Ohio.

WATER SOFTENERS AND PURIFIERS
Scaife, Wm. B., & Sons Co., Ptgh.

WELDING—Electric
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

WELDING MACHINES—Butt
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—(Electric Arc) Second Hand
Goodman Elec. Mchry. Co., Newark, N. J.
Mill Supply Corp., Watervliet, N. Y.

WELDING MACHINES—Seam
Federal Mch. & Welder Co., Warren, O.

WELDING MACHINES—Spot
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—(Spot), Second Hand
Taylor-Hall Welding Corp., 5 May St., Worcester, Mass.

WHEELS—Rolled Steel
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.

WINDOWS—Steel
Truscon Steel Co., Youngstown, Ohio.

WIRE—Barb
Jones & Laughlin Steel Corp., Pittsburgh.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
Michigan Wire Cloth Co., 2117 Howard St., Detroit.
Phosphor Bronze Smelting Co., Phila.

WIRE—Flat, Round, Square or Special Shapes
Page Steel & Wire Co., Bridgeport, Ct.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.

WIRE—Insulated
Roebling's, John A., Sons Co., Trenton, N.J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N.J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Netting
Cleveland (O.) Wire Cloth & Mfg. Co.
Roebling's, John A., Sons Co., Trenton, N.J.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
New England High Carbon Wire Co., Worcester, Mass.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Webb Wire Works, New Brunswick, N. J.

WIRE—Special, Drawn Shapes
Rathbone, A. B. & J., Palmer Mass.

WIRE—Spoke and Crimping
Prentiss, Geo. W., & Co., Holyoke, Mass.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring
Barnes, Wallace Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Company.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh.
New England High Carbon Wire Co., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Steel
Johnson Steel & Wire Co., Inc., Worcester, Mass.

WIRE—Welding
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE CLOTH
Buffalo (N. Y.) Wire Works Co., Inc.
Cleveland (O.) Wire Cloth & Mfg. Co.
Michigan Wire Cloth Co., 2117 Howard St., Detroit, Mich.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Bros., Cortland, N. Y.

WIRE COILING AND SPIRALLING MACHINERY
Hoagland's, M., Sons Co., Rockaway, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE DRAWING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machry. Co., Cuyahoga Falls, O.
Waterbury (Ct.) Farrel Fdry & Mch. Co.

WIRE FORMING
Amer. Spiral Spring & Mfg. Co., Ptgh.
Buffalo (N. Y.) Wire Works Co., Inc.
Cleveland (O.) Wire Spring Co.
Cuyahoga Spring Co., Cleveland.
Fischer, Chas., Spring Co., 212 Kent Ave., Brooklyn, N. Y.
Hindley Mfg. Co., Valley Falls, R. I.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Titchener, E. H., & Co., Binghamton, N. Y.
Wickwire Bros., Cortland, N. Y.

WIRE FORMING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Manville, E. J., Mach. Co., Waterbury, Ct.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE MILL MACHINERY AND EQUIPMENT
Shuster, F. B., Co., New Haven, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Mchry. Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY
National Mchry. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE ROPE
American Cable Co., Inc., 100 E. 45th St., N. Y. C.
Broderick & Bascom Rope Co., St. Louis.
Leschen, A., & Sons Rope Co., St. Louis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE ROPE FITTINGS
American Cable Co., Inc., 100 E. 45th St., N. Y. C.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Franklin Mfg. Co., New Haven, Conn.
Lewis Mch. Co., The, Cleveland, Ohio.
Nilson, A. H., Mch. Co., Bridgeport, Ct.
Shuster, F. B., Co., New Haven, Ct.

WIRE STRANDING AND CLOSING MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BLOCK FLOORING—See Flooring—Creosoted Wood

WOOD-WORKING MACHINERY
Osborne & Sexton Machry. Co., Columbus, O.

WORK EJECTORS—Air Operated
Logansport (Ind.) Mch. Co.

WRAPPING ROLLS
Buffalo (N. Y.) Forge Co., 492 B'way.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Billings & Spencer Co., Hartford, Conn.
Cleveland (O.) Punch & Shear Wks. Co.
Indianapolis (Ind.) Drop Forging Co.
Williams, J. H., & Co., Buffalo, N. Y.

ZINC—Cold Rolled Strips
Hegeler Zinc Co., Danville, Ill.
Platt Bros. & Co., The, Waterbury, Ct.

ZINC—Slab (Spelter)
Erdle Perforating Co., Rochester, N. Y.
Hegeler Zinc Co., Danville, Ill.
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

(ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
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The Clearing House

THE Ritterbush PAGE

LIQUIDATION

COMPLETE EQUIPMENT OF FORMER SIMPLEX UNIVERSAL JOINT CO.'S PLANT, FLEMINGTON, N. J. INSPECTION CAN BE MADE AT PLANT DAILY. ADDRESS ALL COMMUNICATIONS TO US AT NEW YORK.

AUTOMATICS

3—Potter & Johnston 6A Model 2, and one (1) Model 2-P, all single pulley late type with considerable extra tooling.
4—Reed-Prentice No. 1 Production Lathes, single pulley, geared head.
1—Jones & Lamson Turret Lathe, single pulley.

DRILLS

2—Baker heavy duty, single spindle; one with quick change feeds and speeds.
2—20″ Excelsior single spindle, back geared; one equipped with 6-spindle U. S. Multiple Drill Head.
1—Double Spindle Sensitive Drill with geared speeds.

GRINDERS

1—No. 50 and one (1) No. 60 Heald Internal Grinders.
1—No. 4 Badger Double Head Single Pulley, 18″ wheels.
1—Cincinnati No. 1 Universal Tool Grinder.
1—Capitol Internal Grinder, single pulley, ball bearing.
1—Ott 5″ x 18″ Plain, power feed.
1—Oakley No. 2 Universal Cutter and Tool.
1—Wells Cutter and Reamer.
Cincinnati Gear Hobber, single pulley, considerable tooling equipment.

LATHES

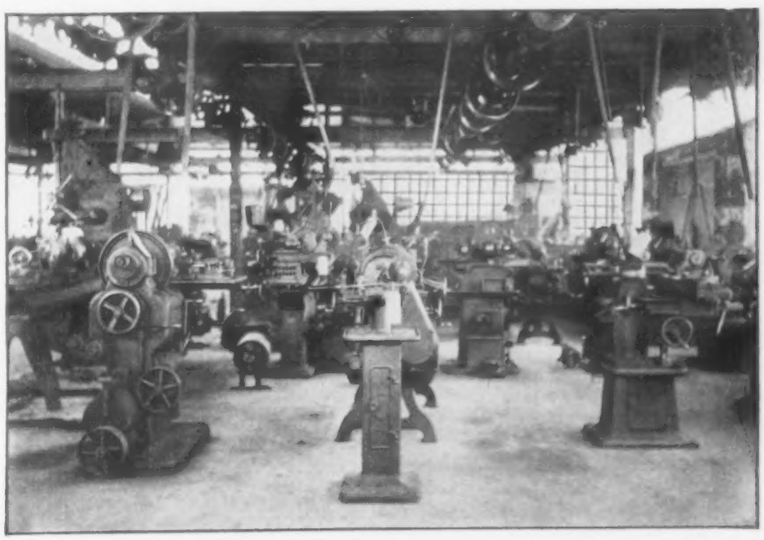
2—Monarch 14″ swing, 6′ bed.
1—Hamilton 16″ swing, 6′ bed, taper attachment.
1—Hendey 16″ swing, 6′ bed, cone drive, taper attachment.

MILLING MACHINES

1—Cincinnati No. 1½ Plain, cone drive, index heads.
1—Cooley & Edlund Lincoln Type, equipped for wet work.
Various other Lincoln Type and hand feed Plain Millers.
Ohio Shaper, cone drive with vise and revolving table.

MISCELLANEOUS

Heating plant, fresh water system, small tools, bar steel, etc. Shore Instrument Company Scleroscope, Dumore Internal Grinding Attachment, Lewis-Shepard "Jack Lift" Elevating Hand Truck with several bodies. Geier Shaft



Photograph of interior of the Simplex Universal Joint Company's plant showing some of the machinery.

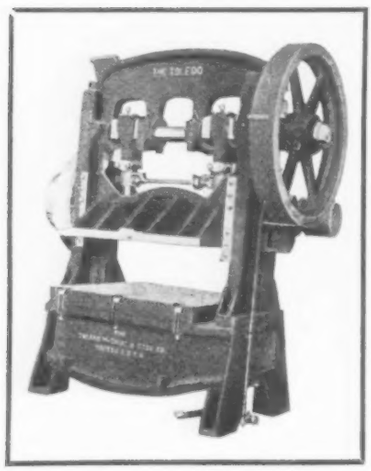
MISCELLANEOUS

Straightening Machine. Buckeye Blueprint Making Machine. One No. 3 Double La Pointe Broach and one (1) No. 1 Single La Pointe Broach with various broaches. Several 3 ph. 60 cy. 220 v. A. C. motors, benches, cabinets, metal partition, etc.

Manufacturing RITTERBUSH & COMPANY, INC. Equipment
30 CHURCH ST.
NEW YORK CITY

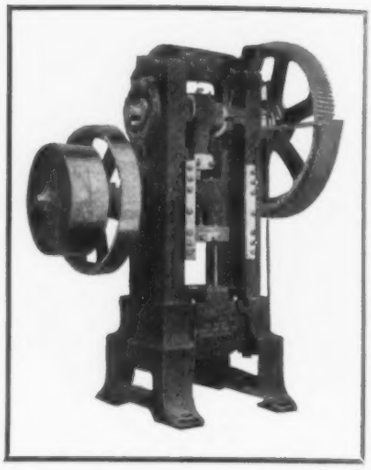
The Clearing House

PRESSES



DOUBLE CRANK

1—No. 95-C Toledo; 60" between uprights.
1—No. 94-E Toledo; 54" between uprights.
1—No. 95½ Toledo; 60" between uprights.
3—No. 92-C Toledo; 42" between uprights.
1—No. 91-D Toledo; 42" between uprights.
1—No. 201A Toledo; 24" between uprights.
1—No. 545½ Hamilton; 54" between uprights.
2—No. 426 Hamilton; 42" between uprights.
1—No. 425 Hamilton; 42" between uprights.
1—No. 424½ Hamilton; 42" between uprights.
1—No. 4-C Bliss; 48" between uprights.
1—No. 3-C Bliss; 54" between uprights.
1—No. 3 Bliss; 36" between uprights.
1—No. 3-C Bliss; 48" between uprights.
1—No. 3-A Bliss; 36" between uprights.
1—No. 4 Bliss; 36" between uprights.
2—No. 23-J Bliss; 102" between uprights.
2—No. 23-A Bliss; 36" between uprights.
1—No. 1-A Bliss; 28" between uprights.



STRAIGHT SIDE, SINGLE CRANK

2—No. 58 Toledo.
1—No. 57½ Toledo.
2—No. 57 Toledo.
1—No. 55½ Toledo.
1—No. 3119 Hamilton (wt. 80,000 lbs.).
1—No. 78½ Bliss.
1—No. 510 Niagara.
1—No. 56 Consolidated.
1—No. 4 Massillon.
1—No. 6 American Can.
2—No. 73 Bliss.
2—No. 203 Bliss.

Full details, photograph, prices, etc., will be sent upon request.

SOLID BACK TYPE

4—No. P2 Ferracute.
16—No. P3 Ferracute.
4—No. P4 Ferracute.
3—No. P5 Ferracute.
1—No. P6 Ferracute.
1—No. 3 Bliss.
1—No. 95 Bliss.
3—No. 75 Bliss.
1—No. 33 Toledo.

We also have a large number of presses in drawing, toggle, open back inclinable, horning and other types.

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MACHINE TOOL SALE

ENTIRE EQUIPMENT FOR SALE OF THE PLANT OF
THE WOONSOCKET MACHINE AND PRESS DIVISION

TO BE SOLD AT ONCE

A PARTIAL LIST OF MACHINERY INCLUDES:

Brown & Sharpe, Gould & Eberhart Gear Cutters, and Gleason Generators. Foote-Burt Drilling and Boring Machines six and seven Spindles, Potter & Johnston 5A and 6A automatics. No. 53 National Acme Automatics, Gridleys One and Four Spindle Machines, also Gridley 2" four Spindle Machine practically new. 33" and 36" Ingersoll Planer Type Milling Machines with Four Heads, also 48" with Two Heads. 30" x 12' Whitcomb second Belt Drive Planer with Two Heads, Powell 30" x 18' with Two Heads. Newton 6 ft. Arm Radial Drill. 72" Betts Vertical Boring Mill Two Swivel Heads. 42" Bullard & Niles 36" Vertical Mills. Also Lathes 14" to 30" Swing 6 ft. to 14 ft. beds, Milling Machines, Upright Drills, Plain and Universal Grinders, Sensitive Drills, Tapping Machines. Equipment of Blacksmith and Forge Shops including Beaudry and Dupont Hammers, Forges, etc. Rattlers and Tumbling Barrels. Hack saws, small tools, Machinists Vises, Buffing and Polishing Lathes, etc., etc.

600 MACHINE TOOLS IN ALL 600

IN INDIVIDUAL LOTS TO SUIT PURCHASERS.
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WOONSOCKET MACHINE AND PRESS DIVISION

WOONSOCKET, R. I.

Tel. No. Woonsocket 1130

Per Order: WHITIN MACHINE WORKS

Master's and Receiver's Sale

U. S. District Court, Eastern District of Penna. Dec. Term, 1925, No. 3527. In Equity. In the matter of American Exchange. Irving Trust Co., Trustee, vs. Eastern Steel Co., and Dec. Term, 1925, No. 3541. In the matter of W. J. Reiney, Inc., vs. Eastern Steel Co.

The Real Estate Machinery, Equipment and Material

of the

EASTERN STEEL CO.

Pottsville, Pa.

to be sold at auction

Mon., Tues. and Wed., April 20, 21 and 22, 1931

at 10 A. M. Each Day on the Premises

NOTE: The Real Estate, Machinery and Equipment will be offered by order of the Master first as an entirety and then in piece-meal lots.

REAL ESTATE

Tract of land, approximately 52 acres, improved with brick office building, electric shop and oil house, frame time office, hospital, several large structural steel buildings housing rolling mills, machine shop, boiler house, etc. Also two Reservoir tracts and several large vacant tracts adjacent to plant. Nine frame dwellings. Also property situate in Eastern part of Island of Cuba, area about 3850 hectares.

MACHINERY AND EQUIPMENT

26 electric, overhead, gantry, traveling and ladle cranes, 10 to 25 tons, 42 to 90 feet span; 17 electric hoists 2 to 10 tons; 20 chain hoists 1 to 6 tons; 6 open hearth and 4 reheating furnaces; 10-55 and 85-ton ladles; 139 4-wheel standard gauge cars; 8-4 to 6-in. angle and alligator shears; 2 coal and manganese crushers; 6 rolling mills; 4 cold and hot saws; 2 condensing and reversing steam engines; 16 350 H. P. water tube boilers; 14 steam, supply, hydraulic and centrifugal pumps; 5 roll turning lathes; 6-30 to 60- ton four- and six-wheel standard gauge locomotives; 3-5 to 30-ton locomotive cranes; 29 dump, flat, hopper bottom and gondola cars; 3 clam shell buckets, 4 track scales, 2 mixed flow turbines; 9 machine lathes, planers, boring mills, gear cutters, shapers, millers, radial drills, bolt cutters, pipe threaders, air compressors, generators, generator sets, motors, 5 miles standard gauge track, etc.

STOCK, SUPPLIES AND OFFICE FURNITURE

Approximately 5000 tons of H and I beams; approximately 2500 tons of billets; approximately 5000 tons scrap; factory supplies and equipment, electrical supplies, small tools, bushings, bearings, valves, bolts, nuts, office furniture, typewriters, adding machines, calculators, and other office equipment, etc.

Note: The stock and office furniture will be sold by order of the Receiver in piece meal lots only.

By Order of

ROLAND S. MORRIS, Master; EDWARD L. HERNDON, Receiver
PEPPER, BODINE, STOKES & SCHOCH, Esqs., Philadelphia, Pa., Attorneys for Receivers.

Descriptive Illustrated Catalogs upon Application to

SAMUEL T. FREEMAN & CO., *Auctioneers*

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80 Federal Street
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MILLERS

PLAIN

2—No. 1½ Brown & Sharpe, cone
2—No. 1½ Rockford, cone
1—No. 1½ AS Milwaukee, single pulley drive, double overarm
1—No. 2 Cincinnati, cone
3—No. 2 Cincinnati, single pulley drive
1—No. 2 LeBlond
1—No. 2 Brown & Sharpe, cone
2—No. 2 Heavy Brown & Sharpe, cone
2—No. 2B Heavy Brown & Sharpe, single pulley drive
1—No. 2B and 2 No. 3B Milwaukee, single pulley drive, double overarm
4—No. 3 Brown & Sharpe, cone
2—No. 3 Kempsmith, cone
2—No. 3 LeBlond, cone
8—No. 3 Cincinnati, cone
2—No. 4 Cincinnati, cone
1—No. 6 National Transit, cone

UNIVERSAL

1—No. 1 Cleveland, single pulley drive
1—No. 1½ Valley City, cone
1—No. 2A Brown & Sharpe, single pulley drive
1—No. 2 Cincinnati, cone
1—No. 2 Kempsmith, cone
1—No. 2½ LeBlond, cone
1—No. 3 Ohio, cone
1—No. 3 Kempsmith, cone

VERTICAL

2—No. 2 Cincinnati, single pulley drive
2—No. 3 Brown & Sharpe, single pulley drive
1—No. 3B Milwaukee, single pulley drive
2—No. 4 Cincinnati, single pulley drive
3—No. 6 Becker, cone
1—Cochrane-Bly No. 14 Universal Vertical Miller and Shaper

PRODUCTION AND MISCELLANEOUS

1—30" Ingersoll continuous rotary
1—54" Newton continuous rotary
1—40" Ohio tilted rotary
1—24" Cincinnati automatic
1—12" Cincinnati plain mfg.
1—No. 13B Brown & Sharpe manufacturing
1—26" x 24" x 6' Ingersoll adjustable rail
1—48" x 48" x 8' Beaman & Smith openside
2—34" Briggs, type B
1—42" Briggs, type B
3—No. 7 Becker, Lincoln type
3—No. 2 Bilton gear millers
1—No. 12 Barber Colman spline
5—National Transit, drum feed
14—Hand, Whitney, Kent Owens, U.S.
3—No. 2M Potter & Johnston automatic
1—28" Cincinnati duplex
2—Kent Owens semi-automatic
2—Trundel thread, type B
1—Waltham thread, bench type

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MACHINERY COMPANY
SAGINAW, W.S.
MICHIGAN

ReManufactured Machine Tools

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1—PUTNAM, 66"x36' Triple Geared.
1—POND 54"-62"x23' Motor Drive.
1—POND, 48"x50', 2 Carriages.
1—BRIDGEFORD, 36"x14' Geared Head.
1—LODGE & SHIPLEY, 30"x24' Sel. Gd. Hd.
1—LODGE & SHIPLEY, 30"-34"x12'.
10—BRIDGEFORD, 26"x20', 18', 16'.
25—BRIDGEFORD, 26"x14', 12', 10'.
3—LE BLOND, 25"x12'.
4—LODGE & SHIPLEY, 24"x18', 14', 12' Sel. Hd.
1—AMERICAN, 24"-26"x12'
1—HENDEY, 24"x8' Geared Head.
1—LODGE & SHIPLEY, 22"x10' Sel. Gd. Hd.
1—MONARCH, 20"x18'.
12—AMERICAN, 20"x20', 16', 12', 8'.
1—AMERICAN, 20"x8', 12' Geared Hd.
2—LODGE & SHIPLEY, 20"x8' Sel. Gd. Hd.
1—LODGE & SHIPLEY, 20"x8'.
1—REED-PRENTICE, 18"x13' Geared Head.
1—LODGE & SHIPLEY, 18"x10'.
1—LODGE & SHIPLEY, 16"x14' Sel. Gd. Hd.
2—MONARCH, 16"x12', 6'.
3—REED-PRENTICE, 16"x8', 6' Geared Head.
1—HENDEY, 16"x8' Geared Head.
3—LODGE & SHIPLEY, 16"x6'.
1—LODGE & SHIPLEY, 16"x6' Sel. Gd. Hd.
1—LE BLOND, 14"x12' Geared Head.
1—LODGE & SHIPLEY, 14"x8'.
2—REED-PRENTICE, 14"x6', 7' Geared Head.
1—HENDEY, 12"x5'.
1—LO-SWING, 4"x60".
2—FAY, 14" Automatic.
1—LE BLOND, No. 12 Multi-cut.

PRESSES

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6—V & O No. 2, O. B. I.
5—BLISS No. 20, O. B. I.
1—R. & K. No. 4½, O. B. I.
2—BLISS No. 203, Straight Sided.
1—ZEH & HAHNEMANN No. 10.
1—TOLEDO No. 57, Nosing.
5—TOLEDO No. 58, Nosing.
1—CLEVELAND No. 30-G-32, Gap.
1—TOLEDO No. 91-B, Straight Sided.
1—TOLEDO No. 203-B, Gap.
1—BLISS No. 307, Straight Sided, 9" stroke.
1—BLISS No. 5-C, Straight Sided.
1—HAMILTON No. 515½, Straight Sided.

See previous issues for
MILLING MACHINES, BOR. MACH. DRILLS, PLANERS, GRINDERS, GEAR CUTTERS, SCREW MACHINES, SHAPERS.

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1—NILES 10'.
1—BETTS 96".
1—POND 72".
1—NILES, BEMENT, POND 62".
2—RAUSH, 61", 51".
1—GISHOLT 60".
1—PITTSBURGH 60".
1—BULLARD 54".
5—GISHOLT 52", 42", 36", 30".
2—COLBURN 48", 42".
2—PUTNAM 44".
2—KING 42", 32".
1—BULLARD 36" New Era.

TURRET LATHES

3—LIBBY 26", 18".
20—DAVIS 24".
8—STEINLE 24", single pulley drive.
1—GISHOLT 24", 21".
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1—LE BLOND 21"x8', Universal.
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3—JONES & LAMSON 3"x36".
3—JONES & LAMSON 2-spindle.
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2—WARNER & SWASEY 14".
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2—FAY 14", Automatic.

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3A Warner Swasey Universal Turret Lathes
2A Warner Swasey Universal Turret Lathes
1B Foster Geared Head
20 x 10' Lodge & Shipley Engine Lathe
20 x 10' American Engine Lathe
#7 Fellows High Speed Gear Shaper
#12 Barber & Coleman Gear Hobber
#2 Knight Milling and Drilling Machine
#3B Milwaukee Plain Mill, S. P. D.
6' Cincinnati-Bickford Radial Drill, S. P. D.
4 Spindle Sipp High Speed Drill
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20" Gould & Eberhardt Crank Shaper
20" American Crank Shaper
42 x 36 x 16' Cincinnati Planer

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10' Betts Vertical Boring Mill, power rapid traverse, MD.
36" Bullard New Era Type, cutting lubricant system.
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No. 31 Lucas Table type 3" bar, gear box, MD.
5—22" Barnes All Geared Self-Oiling Drills, MD.
4' Cincinnati-Bickford Plain Radial, gear box, MD.
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No. 2M Cincinnati Plain Milling Machine, SP.
2-A Brown-Sharpe Universal Milling Machine, Motor in Base.
2—20" Columbia Shapers, gear box, MD.
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14" x 6' LeBlond Geared Head Engine Lathe.
2—24" Cincinnati-Bickford Sliding Head Drills, TA.
16" x 72" Landis Crankshaft Grinder, Self-contained.
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10' Robinson Press Brake, Vertical Type.
10' Ohl Squaring Shear, 3/16" capacity.

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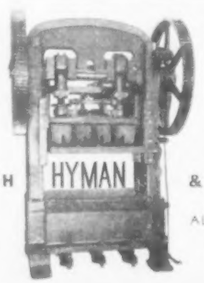

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5—No. 2-M Cincinnati Plain, rectangular overarm.
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48" x 16' Lodge & Shipley all geared head lathe, motor drive.
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24" Gould & Eberhardt shaper, cone drive.
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No. 3B—No. 2B—No. 2BS and No. 1½B Special Milwaukee Pl. Milling Machines, S. P. Drive (DBLE. OVER-ARMS).
No. 4 and No. 3 Cincinnati Hi-Power Vert. Milling Machines, S. P. Drive.
No. 2½B and No. 1½B Milwaukee Vert. Milling Machines, S. P. Drive.
48"—24" and 18" Cincinnati Auto. Duplex Milling Machines.
No. 21 B. & S. Auto. Milling Machine, S. P. Dr.
No. 2 Cincinnati Universal Milling Machine, Cone Pulley, Complete.
No. 2-A Brown & Sharpe Universal Milling Machine, S. P. Drive, Complete.
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27"x14' American Hi-Duty Grd. Hd. Q. C. Lathe.
21"x16' Lodge & Shipley Q. C. Lathe, Taper.
20"x12' American Hi-Duty Q. C. Lathe, Taper.
18"x10' Boye & Emmes Q. C. Lathe.
16"x12' American Hi-Duty Grd. Hd. Q. C. Lathe.
14"x6' Hendey Yoke Head Q. C. Lathe.
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No. 4 Warner & Swasey Universal Turret Lathe.
No. 2—No. 4 and No. 6 W. & S Turret Lathes.
6'—5' & 4' Amer Trip. Pur. Pl. Radials, Gear Box Dr.
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20" Columbia Hvy. Duty B.G. Crank Shapers.
48"x48"x20' Cincinnati Tu-Speed Planer, 4 Heads (BOX TABLE).
36"x36"x10' Cinn. Tu-Speed Planer, 2 Heads.
24"x24x10' Liberty Planer, 1 Head.
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No. 18-H Gould & Eberhardt Hi-Duty Gear Hobbers.
No. 6—No. 61 & No. 615 Fellows Gear Shapers.
No. 4—48" & No. 3—26" B. & S. Auto. Spur Gear Cutters.
No. 2 B. & S. Auto. Surface Grinder (MAG. CHUCK).
No. 2 Diamond Auto. Surface Grinder (MAG. CHUCK).
14" Pratt & Whitney Vert. Surface Grinder, Rot. Mag. Chuck.
No. 16—26" Blanchard Vert. Surface Grinder, Belt Dr.
No. 70 Heald Internal Grinder (Clutch in Head).
6"x18", 10"x24", 10"x36", and 10"x52" Landis Pl. Self Contained Grinders.
No. 4 Brown & Sharpe Universal Grinder.
No. 1½ & No. 2 Cinn. Univ. Tool & Cutter Grinders.
24" Bullard NEW ERA TYPE VERT. BORING MILL.
No. 1 Lambert Horiz. Boring Mill, 3" Dia. Bar.
No. 2132 Stoll Power Gap Shear, Cap. 132" by 14Ga.
No. 91-D Toledo Dble. Crank Geared Power Press.

And Many Others *Send Us Your Inquiries*

THE EASTERN MACHINERY CO.
3253 Spring Grove Ave. Cincinnati, Ohio

New 3 phase motors 1 to 15 H. P. 5 H. P., $65.50

Boring Mill, No. 3 Colburn, Vertical.
Compressors, 6x5, 6x6, 8x8.
Drill, Baush, 5' radial.
Drill, Hilbert, 3' radial.
Drill, No. 66 D Moline Hole Hog, 7 spindle.
Drills, 24", 26", 28" and 32" sliding head.
Furnace, Weco elec. oven.
Gear Cutter, No. 13 Brown & Sharpe.
Grinders, Surface No. 1 and No. 7S W. & M.
Grinder, 6"x15" Fitchburg, plain.
Grinder, 12"x36" Cincinnati, Universal.
Grinder, 16"x48" Landis Universal.
Lathe, 13"x6' Willard, quick change.
Lathe, 14"x6' Monarch, quick change.
Lathe, 15"x16' Sebastian, motor drive.
Lathe, 20"x10' Hamilton, new model.
Lathe, 20"x10' American geared head.
Lathe, 24"x24' Prentice.
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Milling Machines, No. 2 Bilton (2).
Milling Machine, B. & S. No. 2 heavy.
Miller, Becker No. 7.
Miller No. 2 Kempsmith plain, new.
Planer, 24"x24"x6' American, 1 head.
Planer, 36"x36"x12', Gray, extra heavy, 4 heads.
Planer, 36"x36"x14' Gray, two heads.
Planer, 42"x42"x12' Gray, two heads.
Presses, Federal open back inclinable.
Presses, Nos. 1, 1½, 2 and 4 Robinson.
Punch and Shear, ½"x½", 10" throat.
Screw Machine, Defiance No. 4.
Screw Machine, Milholland 1" and 1¼".
Shaper, 16" American Back Geared Crank.
Shaper, 16" O. & S., new.
Shaper, 24" O. S. cone drive.
Shear, No. 362 Robinson square.
Shear, square 60" Pexto, 18 gauge.
Shear, No. 20 Quickwork, 14 gauge, 30" throat.
Shear, No. 12 Pettingell, 60" throat.
Washing Machine, Blakeslee.

THE OSBORNE & SEXTON MACHINERY COMPANY
COLUMBUS OHIO

BORING MILLS—Horizontal

1—LUCAS No. 32 Precision.
1—N-B-Pond 72 in. Duplex.
1—JONES 4 in. Bar Precision.
1—BARRETT No. 3 Cylinder.
1—BETTS No. 3 Knee Type.

BORING MILLS—Vertical

6—N-B-Pond 12 ft. 100, 72, 62, 44 in.
1—NILES 16, 10-16 ft. Extension.
1—CINCINNATI 96-in.
1—BETTS 96 in.
2—GISHOLT 32, 24 in.
3—COLBURN 48, 34 in.
3—BULLARD 42, 36, 24 in.
1—N-B-Pond 33-44 in.

SHAPERS

3—CIN. 32, 24, 20 in.
1—Q. CITY 28 in.
3—AMERICAN 28, 24, 20 in.
1—LYND FARQUHAR Openside 26 in.
2—STEPTOE 24, 20 in.
3—G. & EBERHARDT 24, 20, 16 in.
2—STOCKBRIDGE 24, 16 in.
1—POTTER & JOHNSTON 15 in.

DRILLS—Radial

4—AMERICAN 6, 5, 3, 2½ ft. Plain.
1—FOSDICK 6 ft. Plain.
2—CIN.-BICKFORD 5, 4 ft. Plain.
1—AMERICAN 6 ft. Universal.

MILLING MACHINES

6—CIN. Nos. 5, 4, 3, 2 Plain.
4—CIN. Nos. 4, 3 Vertical.
3—CIN. Nos. 4, 3, 1½ Universal.
4—MILWAUKEE Nos. 3-B, 1½-A, 1-B Pl.
2—MILWAUKEE Nos. 1-B, 3-B Univ.
4—CIN. 48, 24, 18 in. Automatic.
2—KEMPSMITH Nos. 2, 3 Universal.
3—LEBLOND Nos. 4, 3, 2½ Plain.
2—INGERSOLL 24x24x10 ft. Adj. Rail.

TURRET and SCREW MACHINES

10—W. & SWASEY Nos. 6, 4, 2-A, 3-A, 1-A.
2—B & OLIVER Nos. 4, 4½x30.
4—P. & W. 1x15, 1½x18, 2½x26, 3x36.
2—LIBBY 18, 26 in.
3—GISHOLT 24, 24, 34 in.

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BUFFALO, 601 Morgan Bldg.
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1—12"x 6' 3-Step Cone D.B.G., L & S Gap Lathe.
1—14"x 6' 3-Step Cone D.B.G., L & S Lathe.
1—14"x 5' Selective Head, L & S Lathe with Pan.
1—16"x 6' Marvel Chucking L & S Lathe.
1—16"x 8' 3-Step Cone D.B.G., L & S T/R Lathe.
1—18"x 6' Selective Head, L & S Lathe.
1—18"x 8' Selective Head, L & S Lathe.
1—18"x10' Selective Head, L & S Lathe.
1—20"x 6' Selective Head, L & S Lathe.
1—22"x10' Patent Head, L & S Chucking Lathe.
1—22"x30' Selective Head, L & S Lathe.
1—22"x20' 3-Step Cone D.B.G., L & S Lathe.
1—30"x18' 3-Step Cone D.B.G., L & S Lathe.
1—30"x18' Selective Head, L & S Lathe.
1—36"x18' 3-Step Cone Head D.B.G., L & S Lathe.
1—36"x16' Selective Hd., L & S Tr. Geared Lathe.
1—30"x56' Heavy Duty, L & S Forge Drilling Lathe.
1—24" Bullard "New Era" type Vertical Turret Lathe, with cutting lubricant system.
1—Reversing Planer control for D.C. Motor complete with 15 H.P., 115 Volt, 225-900 R.P.M. Variable Speed Motor.
1—Buffalo Forge Co. Fan and Heater Unit.
1—Automatic Thread Chasing Machine.
1—Rement-Niles Co., Horizontal Boring Machine.
1—Heald No. 210 Ring Surface Grinder.
1—Cinti Gear Cutting Mach. Co. No. 3 Gear Cutter Grinder.
1—Brown & Sharpe No. 4—36" Automatic Gear Cutter.
1—Bryant No. 10 Semi-automatic Internal Grinder.
1—Newton Vert. Slab Miller. Working Surface of Table 10"x6. Max. Dist. from Spdle. to Table 21".
1—3 H.P., 220 V., 1500 R.P.M., D.C. Reliance motor. *Send for complete detailed descriptions.*

The Lodge & Shipley Mach. Tool Co.
Cincinnati, Ohio

BORING MILLS

1—BULLARD 24" ver., N. E. type.
3—BETTS 7', 8', 10'.
1—NILES 10'-16' extension ver.
1—NILES 16'-24' extension ver.
1—SELLERS 72" Ver.
1—LANDIS No. 35—3½" bar horiz.
1—N.B.P. 4" bar table type, horiz.
1—BARRETT No. 2—5" bar horiz.

DRILLS—Multiple Spindle

4—BAUSH No. 1, 2, 3, round and ret. hds.
1—FOX D-31 round hd.
6—NATCO No. 12, 13, 14, 30 and 37 round and rect. hd.
1—MOLINE No. 5-D Cyl. Borer.

DRILLS—Upright

1—AVEY MATIC 3-spindle P.F.
1—COLBURN D-4.
6—HENRY & WRIGHT 1-2-3-4 spdle.
1—LELAND & GIFFORD, 2 spdle.
1—SIFF, 2 and 4 spindle.
1—P & W No. 1 and No. 12 deep hole.
1—BAKER No. 310.

DRILLS—Radial

1—AMERICAN 2½' Pl. SPD.
1—AMERICAN 3' Triple geared.
1—AMERICAN 3' triple purp. SPD.
1—AMBRICAN 4' plain SPD.
1—HAMMOND 4' Pl.
1—BAUSH 6' Pl. belt drive.
1—N.B.P. 96" Pl. MD.
2—CINCINNATI-BICKFORD 4' and 6' Univ.

GEAR CUTTERS

12—B & S 3x36, 4x36, No. 6, 60 in. No. 13
6—BARBER-COLMAN No. 12.
7—LEES-BRADNER No. 5-A.
1—PFAUTER No. 2, 40" cap.
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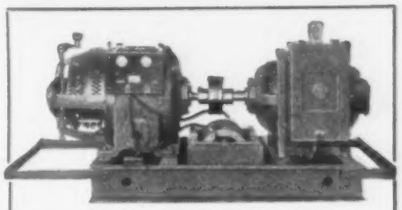

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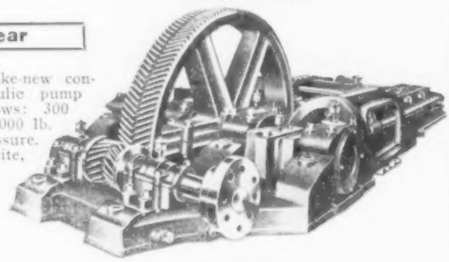

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1—75/100	500/1000	Cruc.Wheeler	CMC-81H
2—50	225/450	Westgh.	SK-190
2—40	300/900	Westgh.	SK-170
1—35/15	500/1500	Gen. Elec.	RLC-203
1—35	500/1500	Gen. Elec.	RF-13
1—30/10	210/840	Electro Dyn.	30-S
1—25/33	275/825	Electro Dyn.	25-S
1—25/10	400/1200	Electro Dyn.	20-S
3—20/25	500/1500	Gen. Elec.	RF-12
5—15/20	500/1500	Westgh.	SK-110L
6—10	500/1500	Westgh.	SK
4—10/13	400/1600	Gen. Elec.	RLC-116
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Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912

OF THE IRON AGE, published weekly at New York, N. Y., for April 1, 1931.

State of New York, County of New York, ss.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared C. S. Baur, who, having been duly sworn according to law, deposes and says that he is the Business Manager of The Iron Age, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 111, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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Editor, W. W. Macon, 239 W. 39th Street, New York City.

Managing Editor, G. L. Lacher, 239 W. 39th Street, New York City.

Business Manager, C. S. Baur, 239 W. 39th Street, New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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C. S. BAUR, Business Manager

Sworn to and subscribed before me this 20th day of March, 1931.

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SITUATIONS WANTED

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NIAGARA DOUBLE CRANK PRESSES

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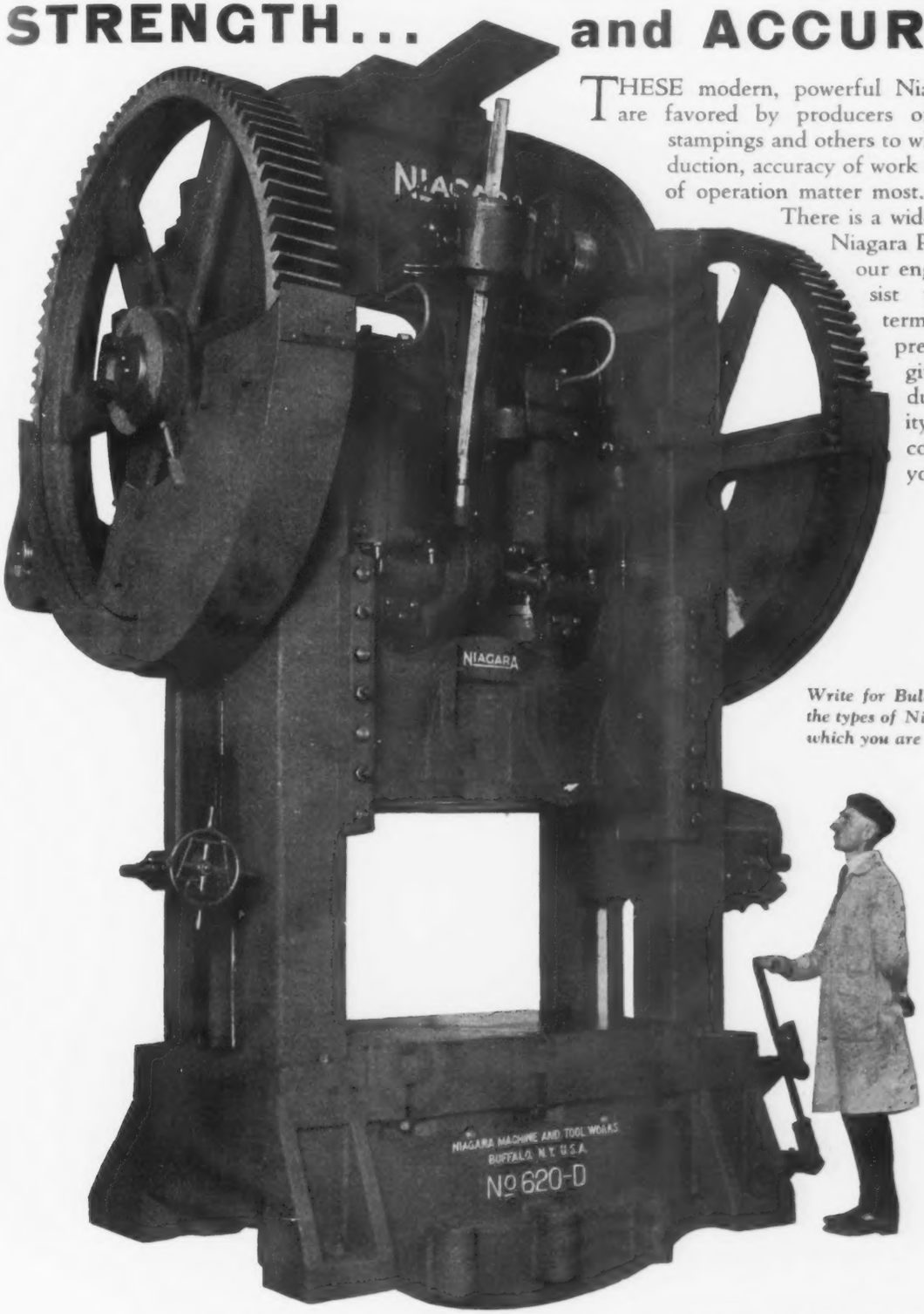

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"This type of bearing we found to be most suitable for our application as it absorbs all radial loads and end thrust"

30 ton Timken-equipped Chisholm-Moore Cyclone Hoist and Matchless Tandem Trolley installation used to install huge stone crusher. The largest piece handled weighed 32 tons.

Tapered Roller TIMKEN BEARING EQUIPPED

CHISHOLM-MOORE HOIST CORPORATION
(DIVISION OF COLUMBUS McKINNON CHAIN CORPORATION)
TONAWANDA, NEW YORK

October 24, 1930.

The Timken Roller Bearing Co.,
Canton, Ohio.

Gentlemen:

Timken Tapered Roller Bearings were adopted as standard on our Matchless Trolleys and C-M Underhung Cranes after considerable experimenting with different types of bearings. This type of bearing we found to be most suitable for our application, as it absorbs all radial loads and end thrust.

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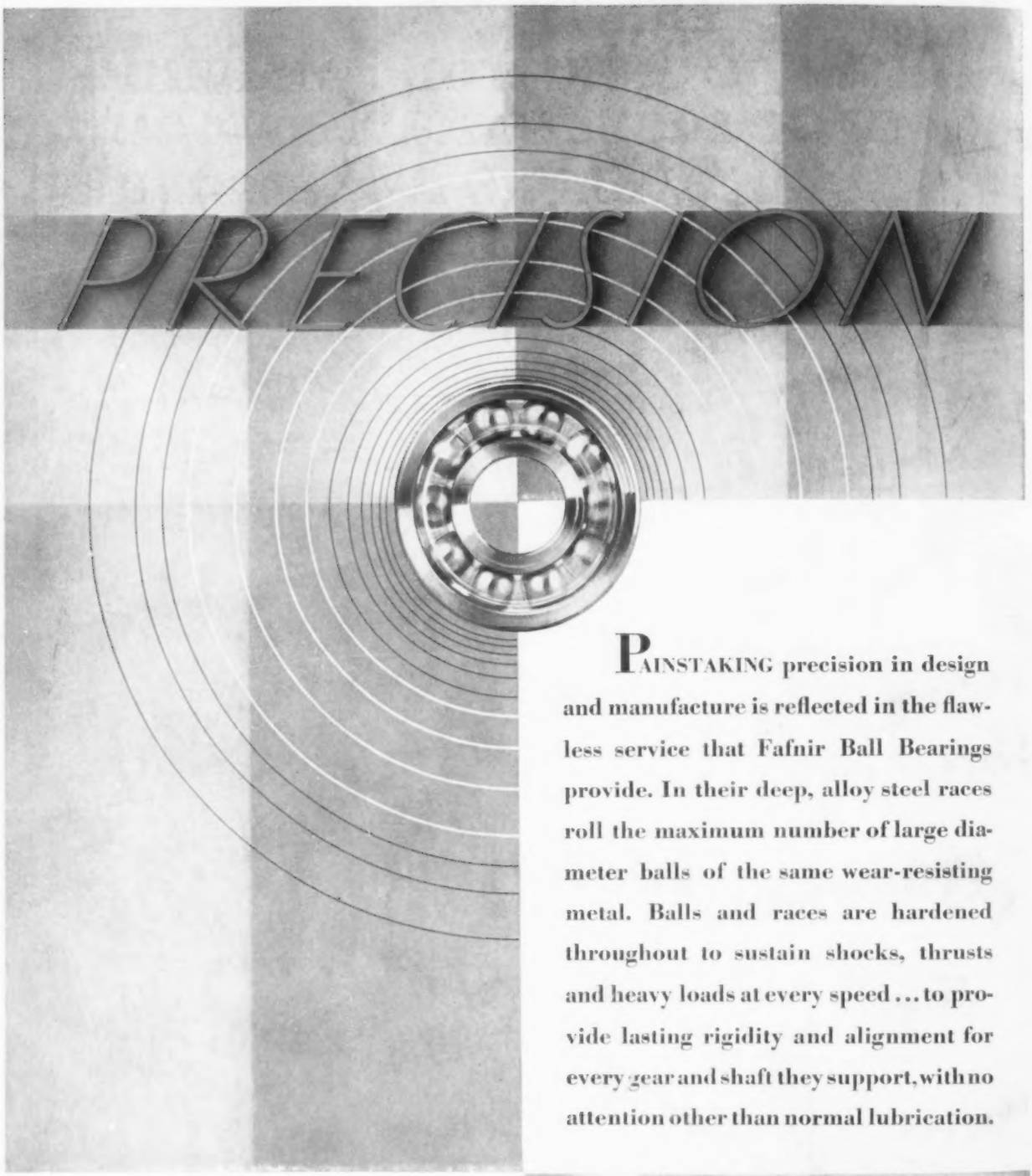
We have been using Timken Tapered Roller Bearings for approximately ten years, and have found them most satisfactory in every way.

Very truly yours,
CHISHOLM-MOORE HOIST CORP.
F. S. Shaw
F. S. Shaw,
Sales Manager.

FSS:H

TIMKEN Tapered Roller BEARINGS



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THE IRON AGE

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"OFF THE ASSEMBLY LINE"

"I FIND your weekly report on the automobile industry highly interesting," an automobile manufacturer told us recently. "Off the Assembly Line," which is the title of the Detroit report, is growing in popularity at a rapid rate. And no wonder, when you consider the amount and variety of timely and significant information packed into the page or so of space that it occupies.

So broad is its appeal that it is drawing readers from practically all classes of executives served by The Iron Age —production men, administrative officials, metallurgists, purchasing agents, sales executives, to mention some of them.

Curiosity as to what is going on in the country's most colorful industry is only a partial explanation of the power to attract exercised by "Off the Assembly Line." The automobile industry is a notable pioneer in the use of new methods and new materials. Its buying power is so great and diversified that its fortunes are reflected directly in the prosperity of a host of other industries. Whether it leads or follows general business improvement is debatable, but that it is a barometer to be closely watched is unquestionable.

You will find "Off the Assembly Line" on page 1218.

—A. H. D.

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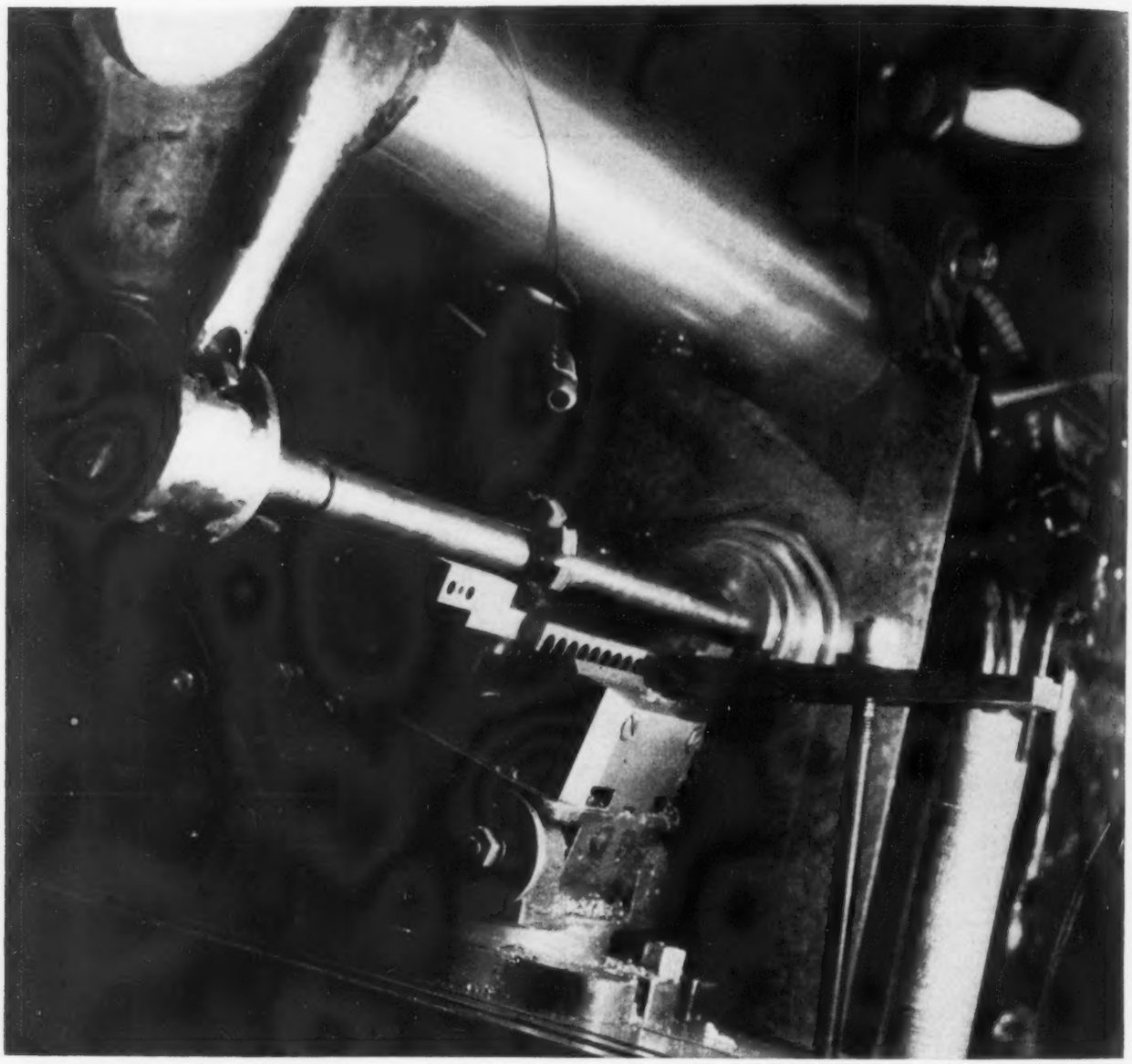
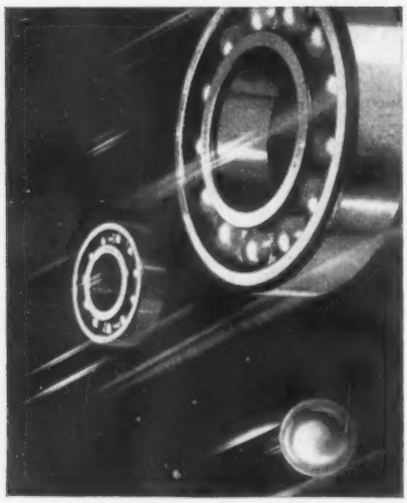
76th IRON AGE YEAR





Your modern milling machine . . .

must be fast and accurate. New Departure Ball Bearings help to gain these important attributes. They are exactly fitted for the strenuous and complex loads that milling machine bearings must endure. Spindle mountings incorporating New Departure Perfex bearings may be preloaded to any desired degree of rigidity. Preloading does not impair their free-rolling efficiency which is the essence of power-saving. And those twin breeders of trouble—heat and wear—are conspicuously absent from all New Departure mountings because "nothing rolls like a ball." The New Departure Mfg. Company, Main Offices and Works, Bristol, Connecticut; Detroit, Chicago, San Francisco and London.

NEW DEPARTURE BALL BEARINGS

1712

THIS ISSUE IN BRIEF

APRIL 9, 1931

Four-fifths New Every Decade

At least 80 per cent of our industrial methods are so completely modified during a 10-year period as to have but slight resemblance to their predecessors.—Page 1143.

* * *

How Much of the Production Cost Is Chargeable to Handling?

Hidden handling items are concealed in nearly every operation. When you analyze your costs and drag these items out into the light, you will find they are big profit eaters. —Page 1145.

* * *

Works Manager *Must* Know Handling

For it enters and affects every department of his plant. Through that knowledge he will make a large portion of his future profits.—Page 1145.

* * *

Exorbitant Cost of Interdepartmental Handling

If no set-up is provided, the cost of moving a package 1000 ft. may exceed the cost for 100 miles. The cost may be hidden, as the messenger may be a clerk or supervisor. A shop express plan, operated by means of industrial trucks running on schedule, will systematize deliveries. — Page 1146.

* * *

Eliminate Wasteful Delivery Receipt Red-Tape

For interdepartmental deliveries one firm uses a serially numbered tag with two detachable stubs. The shipper retains first stub, and truck driver has second stamped as a receipt. The remainder of the tag is left on the material as identification.—Page 1147.

* * *

Iron with 11 Per Cent Aluminum

At 2 to 3 per cent aluminum, practically all the carbon is graphitic; at 11 per cent the graphite disappears entirely; at 18 per cent the carbon again becomes graphitic.—Page 1149.

* * *

High-Manganese Steel Welded Successfully

New manganese welding rod contains approximately 13 per cent manganese, 3 per cent nickel and 0.80 carbon.—Page 1204.

* * *

Hydrogen Preferable for Welding Light Material

Temperature is easier to control, than with acetylene, says metallurgist. Metal flows better and a clean, sound weld is obtained.—Page 1204.

"Shop Expressmen" Paid a Bonus for Deliveries

Bonus is based on number of packages handled. Shop express has been found much more economical than departmental messengers. Cost of delivery is 2½c. to 3½c. a package. Fifteen messengers at 35c. or 40c. per hr. have been released.—Page 1148.

* * *

Little Demand for Cut-Down Sheet Sizes

Formerly, if a sheet pack had a small defect, it was cut to smaller size. But, as it is difficult now to get a profitable price for cut-down sizes, the sheets are scrapped.—Page 1158.

* * *

Scrap Handling an Important Sheet Mill Operation

Scrap will run 15 per cent or more of the weight of bars rolled. Hydraulic press is commonly used to bale scrap. Baled scrap sells for $2 a ton more. Direct cost of bundling thin sheet scrap from hot mills is around 50c. a ton.—Page 1161.

* * *

Hydraulic Baler Pumps Operated with Soluble Oil and Water

Even though it is necessary to provide means to prevent it from freezing in winter, this mixture is found most economical.—Page 1163.

* * *

Fearing Overproduction, Bankers Refuse New Equipment Loans

To them new equipment means more production. As a matter of fact, it means cost reduction, which is one way out of our present dilemma.—Page 1165.

* * *

Weld Flaws Found with Stethoscope

With reasonable practice, different inspectors will check one another's results. Tests to destruction after stetho-testing many welds reveal that all defects of importance were discovered.—Page 1202.

* * *

Dip Tank and Baking Oven Are Glassed In

No dust can settle on japanned parts. Air is washed and heated by unit gas heaters. Automatic temperature controllers reduce the flame at 475 deg. F. and open the gas valve at 450 deg. F.—Page 1150.

* * *

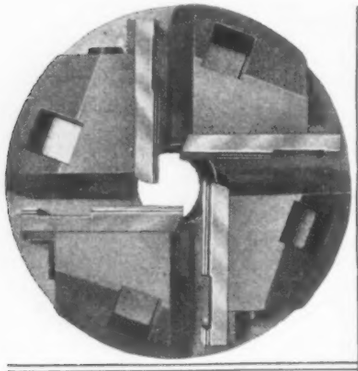
Ideas for Cutting Handling Costs

You may be able to use profitably in your plant some of the ideas shown in the special section beginning on page 1169.

NEXT WEEK

KNOWLEDGE of materials is as important as familiarity with the many ingenious methods devised for handling them. No material in the metal-working industry has such diverse applications as sheet steel. No material is made in such a variety of sizes and finishes.

The first comprehensive survey of the many different kinds of sheets, how they are made and what they are used for will be presented in THE IRON AGE of April 16.



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...for accurate screw threads on a production basis

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Because of its inherent accuracy and its sturdiness in hard service, the J & L Tangent Die produces a maximum number of acceptable screws. Its value as an economical tool can readily be measured on the basis of the cost per screw.

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